JUN 7 8 1932

Pit and Quarry

With which is consolidated

CEMENT-MILL & QUARRY

June 15, 1932

Save Road Building!

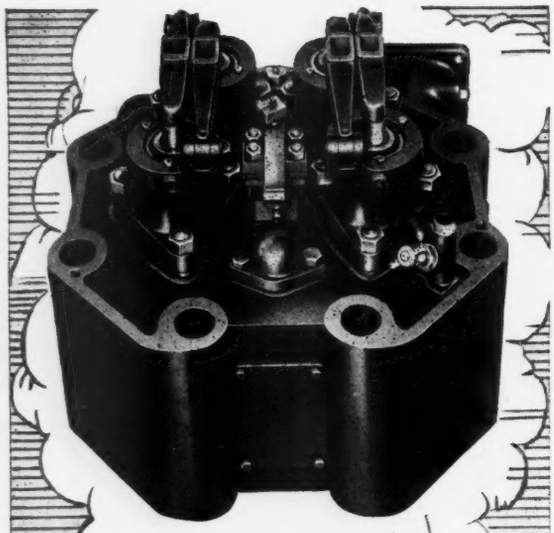
The impending action of congress with respect to relief legislation is frought with grave danger to road building. Two of the three most important bills considered by congress would provide relief for those in distress by taking the needed money from the government's federal-aid appropriations—in one case by deducting the amount of relief money given each state from future highway grants to that state; in the other case by making federal-aid grants the security for repayment of the relief money advanced by the government. The third bill, known as the Garner bill and already passed by the house, is not as objectionable as far as federal-aid is concerned.

The two bills which seriously threaten the future of federal-aid road building are the Wagner bill (S. 4,755) which was adopted, with some changes, by the Senate on June 10—and the Hoover-Mills-Hawley bill, popularly known as the administration's relief bill. The enactment of either of these bills would mean the withdrawal of federal-aid highway money and the withholding of equivalent sums by individual states for years to come. Besides making $300,000,000 available under the existing borrowing power of the Reconstruction Finance Corp., the Wagner bill would provide $136,000,000 for federal-aid, a total of $436,000,000 to be repaid by deductions from future federal-aid grants during ten years. The Hoover bill would provide $300,000,000, chargeable against federal-aid highway grants. These charges would be in addition to the deductions to be made during the next five years to repay the $80,000,000 emergency highway appropriation of 1931. Furthermore, the tax bill's collection of 1 cent a gallon on gasoline—estimated to equal $150,000,000—will go into the government's general tax receipts to be applied to general expenses.

The Wagner and Hoover bills should be defeated and everyone interested in the future of road building should register a strong protest with his representatives at Washington. Producers should write or telegraph at once, urging a vote against these bills before action approving them can be taken. At the same time they should ask for support of the regular federal-aid appropriation as provided by the Oddie bill also before congress. Prompt and vigorous action is imperative if government aid of road building is to be saved.

Since September 11, 1929, the largest net paid A. B. C. circulation in the field

ACCESSIBILITY . . .



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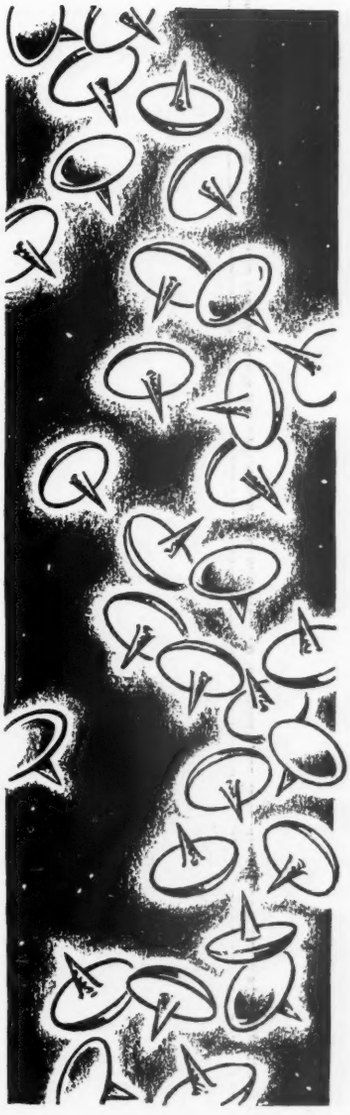

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Pit and Quarry

With which is consolidated
CEMENT-MILL & QUARRY

Volume 24 June 15, 1932 Number 6

MEMBER AUDIT BUREAU OF CIRCULATIONS

Published bi-weekly on Wednesday for producers and manufacturers of Cement, Crushed Stone, Gypsum, Lime, Sand, Gravel and other nonmetallic minerals. Entered as second-class matter October 9, 1928, at the Postoffice at Chicago, Ill., under the Act of March 3, 1879.

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ROLLER BEARINGS ON HIGH SPEED SHAFTS ARE A STEP IN THE RIGHT DIRECTION . . . .

but—You can't expect to eliminate troubles due to excessive friction unless your excavator is equipped throughout with anti-friction bearings.

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DALLAS
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Tyee Machinery Co., Ltd., Vancouver, B. C.

ATLANTA
303 Mortgage Guarantee Building

Classified Buyers' Guide

A Directory of PIT AND QUARRY Advertisers Arranged According to Product

Although every effort is made to insure accuracy and completeness in these listings, the publisher cannot accept responsibility for errors or omissions. Any mistakes discovered will gladly be rectified, if brought to the attention of the Advertisers' Service Department.

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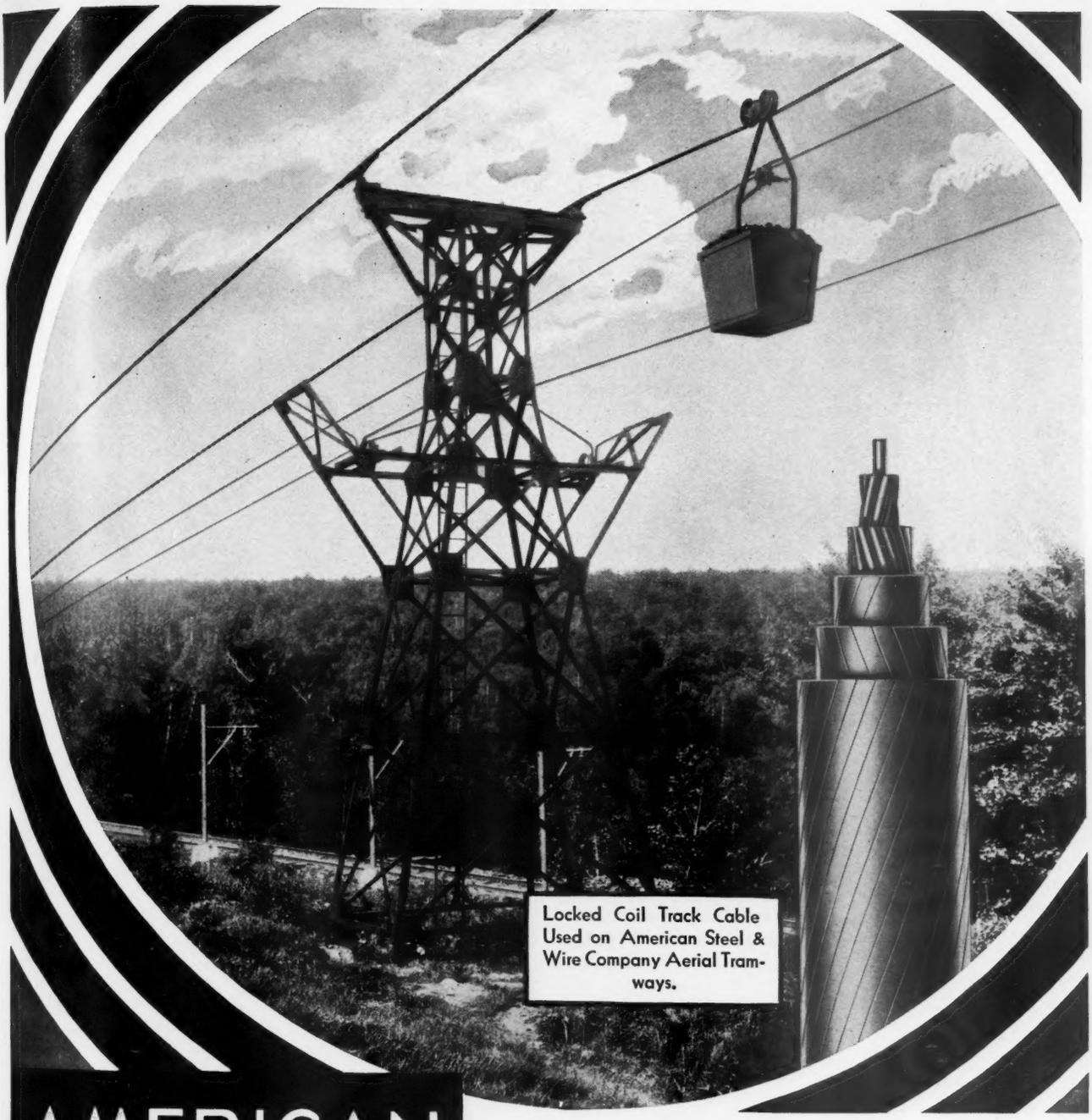

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Classified Buyers' Guide

A Directory of PIT AND QUARRY Advertisers Arranged According to Product

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American Steel & Wire Co.

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Unique flexibility in product regulation without changing parts or speed.
Large capacities, accurate out-puts, low power and upkeep, high efficiency, sturdy construction.

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Cross Engineering Co.
Deister Machine Co.
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Screens (Vibrating or Shaking)
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Iowa Mfg. Co.

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American Steel & Wire Co.

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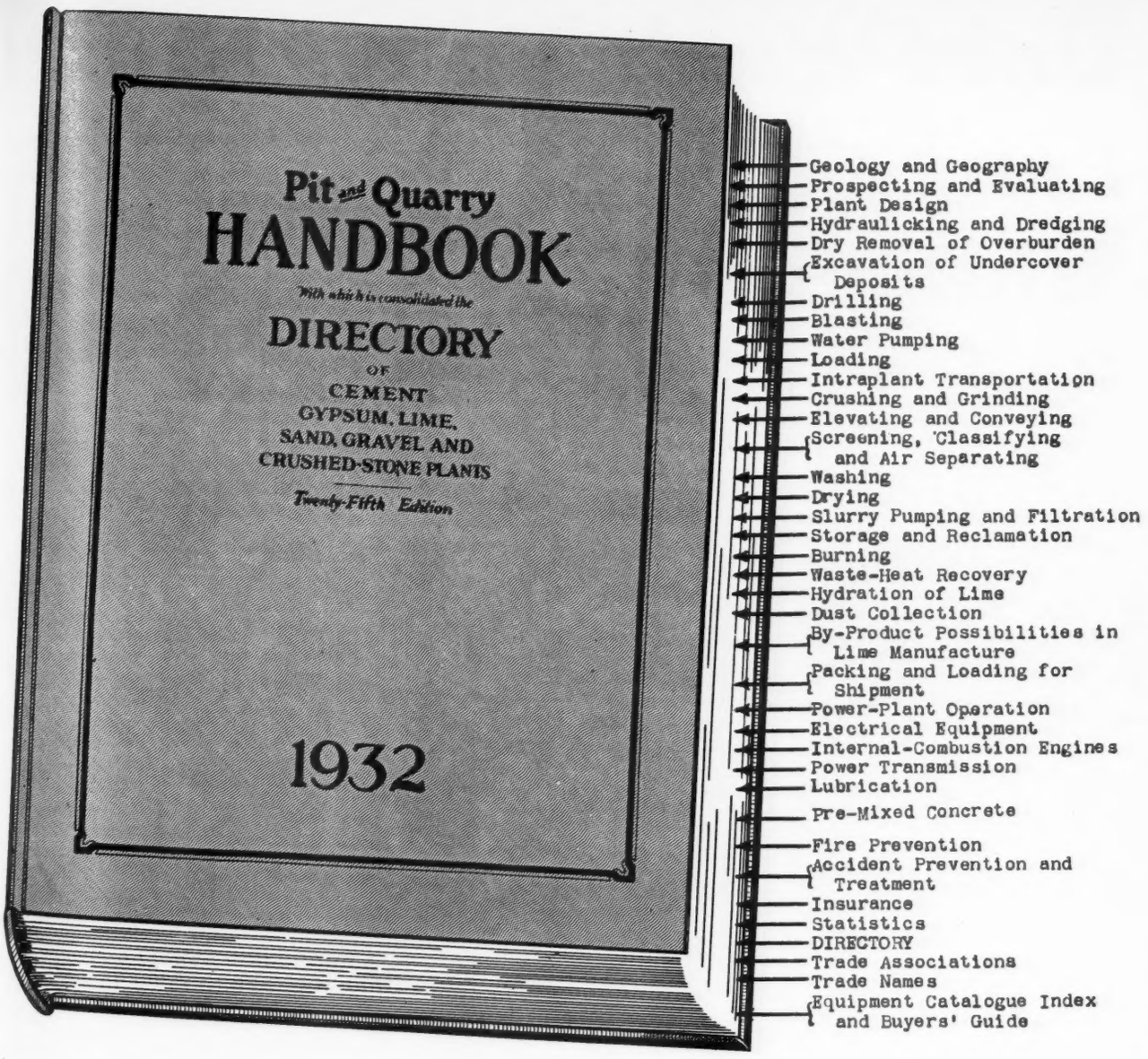
American Steel & Wire Co.

Wire Rope
American Steel & Wire Co.

Wire Rope Slings
American Steel & Wire Co.

Wire (Welding)
American Steel & Wire Co.

Worm Gears (See Gears and Pinions)



Here It Is, at a Glance—Brand New!

The illustration above shows, graphically, the contents of the 1932 edition of Pit and Quarry HANDBOOK and Directory, just off the press. The only book of its kind. Every section has been brought right up to the minute. The Directory is the largest and most complete listing of producers ever compiled—and every item is *verified*.

If you have not already purchased your copy of this indispensable book, order now, before the limited printing is exhausted.

Pit and Quarry Handbook and Directory, 1932 edition.....	$5.00	Clubbed with a 1-year subscription to Pit and Quarry.....	$6.00
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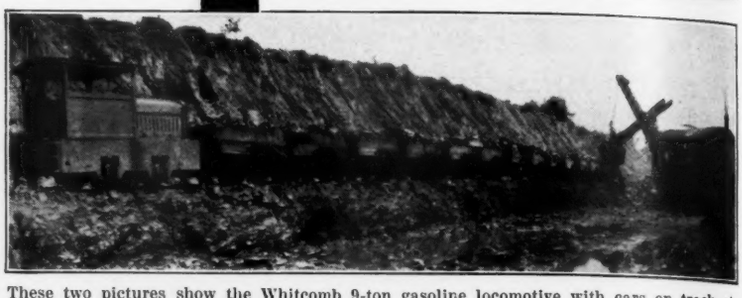
Pit and Quarry Publications

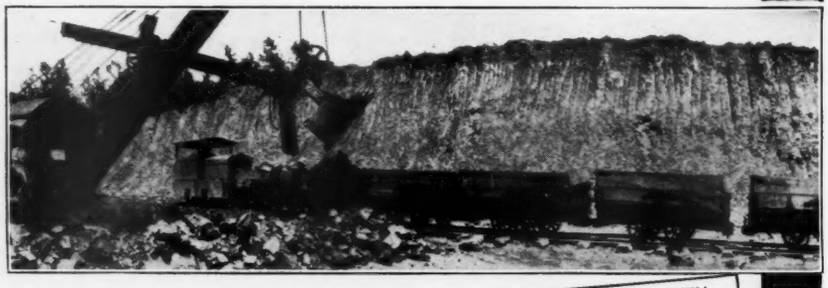
538 S. Clark St., Chicago, Ill.

PIT AND QUARRY HANDBOOK | PIT AND QUARRY | PIT AND QUARRY DIRECTORY

Good Words *Unsolicited* Land a Whitcomb Order . . .



These two pictures show the Whitcomb 9-ton gasoline locomotive with cars on track at the Boddie & Powell mine, Madisonville, Kentucky.



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CLASS OF SERVICE DESIRED

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NIGHT MESSAGE	NIGHT LETTER
NIGHT LETTER	WEEK END LETTER

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WESTERN UNION

NEWCOMB CARLTON, PRESIDENT — J. C. WILLEVER, FIRST VICE PRESIDENT

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TIME FILED

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F. S. Norcross, Jr.,
c/o Monroe B. Lanier,
Birmingham, Alabama

Boddie Powell advise have operated nine ton Whitcomb continuously for five years STOP Accurate maintenance records not available but estimate four hundred dollars for five years STOP Gas consumption about twenty five gallons eight hours continuous operation STOP Well pleased with locomotive advising very efficient on grades and estimate performance equal to fourteen ton steam

R. L. SCHLOTMAN

WESTERN UNION GIFT ORDERS ARE APPROPRIATE GIFTS FOR ALL OCCASIONS

Mr. F. S. Norcross, of the Cuban-American Manganese Corporation of Cuba, was in the market for haulage equipment for their new mining operation at El Cristo, and desired the opinion of an owner and user of a Whitcomb Locomotive. So he wired Mr. R. L. Schlotman, his Company's Purchasing Agent, to get an opinion from the Boddie & Powell Company regarding the Whitcomb used in their strip mining operations at Madisonville, Kentucky. Mr. Schlotman's telegraphic report is given above.

"VERY EFFICIENT" AFTER FIVE YEARS

THE above statement, coming from a firm of the high standing of Boddie & Powell, was convincing testimony, and was followed by the sale of two 20-ton Whitcombs to the Cuban-American Corporation. The order was obtained in the face of strong competition from home and foreign firms, and is very good evidence of Whitcomb's reputation for excellence and reliability.

Whitcomb locomotives perform faithfully under most adverse conditions. The outstanding features which establish their superiority in mining, quarrying and construction operations include low center of gravity, high track clearance, the cross-equalizer that keeps the locomotive in balance on a rough track, and high tractive power on low fuel costs.

Whitcombs make "the economy grade" so desirable in many industries today. Write us regarding your haulage problems.

THE WHITCOMB LOCOMOTIVE COMPANY
ROCHELLE, ILLINOIS

WHITCOMB LOCOMOTIVES

VOLUME 24 NUMBER 6

Pit and Quarry

With which is consolidated

CEMENT-MILL & QUARRY

CHICAGO, JUNE 15, 1932

Gas-Tax Collections Attain Record Level

DIVERSIONS SHOW INCREASE

Aggregate state tax collections for 1931 reached the highest total on record at $536,397,458 net. This was an increase of $42,532,341 over the tax of $493,865,117 paid in 1930, a gain made despite the reduction of 731,178 in the number of vehicles registered, reports compiled by the United States Bureau of Public Roads show. Since the inception of the gasoline tax in 1919, in Oregon, a total of $2,501,544,522 has been paid by motorists.

California again made the largest net collection among the states, $39,863,637. Ohio was second, New York third and Texas fourth. The weighted average tax rate rose to 3.48 c. a gallon, against 3.35 c. in 1930, 3.22 c. in 1929 and 3 c. in 1928. Actual tax rates of the states range from 2 to 7 c. a gallon, and of counties and communities from ½ to 3 c.

Rising taxes on gasoline have been accompanied by diversion of the revenues from the support of highways to other purposes. Last year's diversions amounted to $38,892,625, or $11,513,639 more than the $27,378,986 diverted in 1930.

Including an estimated $2,000,000 for county and community levies on gasoline, last year's total tax was $538,397,458. Adding $344,337,654 paid in registration and license fees, with revenue from other taxes levied on vehicle, operator, or necessities of motoring, the total motoring tax bill of 1931 approaches, if it does not exceed, $1,500,000,000, states the American Petroleum Institute.

Portland Cement Assn. Has New York Meeting

A discussion of promotion policies to fit the new conditions in road, housing and small-use markets for cement was the highlight of the spring meeting of the Portland Cement Assn., held May 31 to June 2 at the Hotel Biltmore, New York, N. Y. Edward J. Mehren, president of the association, acted as chairman of the session.

The first day of the gathering was devoted to meetings of the various standing committees. On June 1, a general session was held for the discussion of technical problems. The feature at this gathering was a paper entitled: "Studies of Fuel Economies in Burning Portland Cement" by H. P. Reid, special engineer, Universal Atlas Cement Co. At the luncheon, the association and J. B. John, president of the Newaygo Portland Cement Co., were honored by the receipt of the Joseph A. Holmes safety awards by the U. S. Bureau of Mines. An informal steak dinner was enjoyed in the evening.

The regular business session was held on June 2, the final day of the meeting.

Silicosis Damage Suits Reach Illinois Courts

The $25,000 damage suit of Russell Keller, former employee of the International Silica Co., of Cairo, Ill., has been in progress in the circuit court at Cairo. Mr. Keller alleges he contracted silicosis while employed by the International company.

Meanwhile, two similar suits, each asking $50,000 damages of the Ottawa Silica Co., brought by former workers of that concern, were dismissed by Judge J. A. Davis, sitting at Ottawa. It was said that a settlement had been effected out of court.

San Francisco Council Spurns Foreign Cement

The proposal of the Merritt-Chapman-Scott Co., which would purchase Belgian-made cement for the construction of the new deep-water terminals at San Francisco, was rapped by the San Francisco city council recently, when it passed a resolution urging that the builders buy cement produced in California or "at least in the United States."

U. S. S. R. to Build Cement Plant in Volga District

A new cement plant for the U. S. S. R. has been authorized by Soviet officials at Moscow, the plant to cost approximately $5,750,000, erected on a site to be selected near Orsk, in the Middle Volga Area.

To Produce Agstone at New Oregon Plant

ANNUAL OUTPUT 500,000 TONS

A group of Portland and Dallas, Ore., business men have formed a corporation for the purpose of producing agricultural limestone at a quarry near Dallas. The material will be sold almost at cost to Oregon farmers and fruit growers, it is reported, and production will be limited exclusively to stone for farm and orchard purposes.

According to present plans, the plant will have a capacity of 500,000 tons of pulverized stone per year. About $35,000 worth of machinery has already been ordered and construction of the plant is under way. The L. A. Snow Co. of Portland is building the plant. M. B. Hamel of Falls City, Ore., will superintend production and Robert E. Shinn, manager of the Willamette Cherry Growers, Inc., will have charge of the distribution of the material.

Report Gravel Business Good in Detroit Region

Business conditions in the Detroit area as related to the sale of sand and gravel have been better so far this year than in 1931, according to Glenn E. Killins of the Killins Gravel Co., which operates a plant at Ann Arbor, Mich.

Mr. Killins said that more orders have been received from contractors than were received over a similar period a year ago. While the firm has made a specialty of larger projects, business received from contractors working on home building has been good.

Alabama Lime Operator Adds Hydrator, 2 Kilns

The Alabaster Stone Co. is erecting two lime kilns and a hydrating plant at Scotrock, Shelby County, on the L. & N. Railroad between Birmingham and Montgomery, Ala., near Siluria, Ala.

Sand Dunes Give Up Hidden Pirate Gold

NUGGETS FOUND IN DELAWARE

Several months ago an aged Negro who owned a small farm near Laurel, Del., turned it over to S. Lloyd Lowe of Laurel because he could not pay the mortgage.

"Thar's gold in them thar hi.ls," the colored man said.

Shortly afterward, Mr. Lowe went over the farm and found good commercial sand and he obtained contracts from a number of road builders for the sand.

As excavators began work on one of the hills recently, two gold nuggets were uncovered, in addition to a quantity of Indian arrow heads, pottery, spearheads and human bones.

The news spread quickly and Mr. Lowe had to station guards about the hills to keep off marauders while he went to Washington, D. C., to have the nuggets essayed. Now, he does not know whether the old colored farmer meant the sand when he spoke of gold, or whether he actually meant gold.

The site once was an Indian camping ground, and is near the bay port of Portsville, where ships "tied up" for the winter a century or more ago.

Gold is not native to lower Delaware and the nuggets might have been buried there with other loot probably by pirates, folks in lower Delaware declare. The district there was once a great place for pirates' landings and camps.

Houston Producer Soon to Operate New Plant

The new sand-gravel plant of the Texas Construction Material Co. of Houston, which is located at Hearne, Tex., is nearing completion and first deliveries of material will be made shortly, according to R. L. McMillan, resident manager, who has had charge of erection. A spur track has been laid from the Missouri Pacific Railroad to facilitate rail deliveries.

This is the second gravel plant to be erected in Hearne, Tex., within the last year or so, the Hearne Sand & Gravel Co., of which L. W. Perkins is president, having begun operation last year and has been producing steadily since that time.

Ottawa Silica Pioneer Dies at Pasadena, Cal.

James Bush Herring, aged 66, chairman of the board of directors of the Ottawa Silica Co., and a prominent figure in Ottawa, Ill., industrial and commercial life for many years, died suddenly of heart disease May 30 at his winter home in Pasadena, Cal.

Mr. Herring had done more than perhaps any other one man to develop the silica-sand industry in Ottawa. Locating there in 1901 as secretary, treasurer and general manager of the Ottawa Silica Co., which he and his brother, the late Charles B. Herring had organized the year before, he directed the management of this concern from a small sand pit through its stages of growth to one of the nation's largest silica-sand corporations.

He had been made secretary and treasurer of the company at its organization. He served as general manager of the concern from 1901 until July, 1922, when he became chairman of the executive board. September 2, 1929, he was elected president of the company to succeed Edmund B. Thornton. He resigned as president February 25, 1932, and was elected chairman of the board of directors.

Improved Business Felt by Indiana Stone Firms

The Indiana Limestone Co. continues to report a slow but sure improvement in building conditions. An official said recently that demand is easily 50 per cent. better than it was a year ago and that work now under consideration on government projects at Washington, D. C., is more encouraging.

It is estimated that the government will spend between $6,000,000 and $8,000,000 on building during the coming months. Much of the work is already under bid and is expected to be let during the next few weeks.

The Heltonville Limestone Co. of Bedford, Ind., recently won a contract for 1,200 carloads of stone to be used in the new postoffice building at Washington.

Damage Suit Decided in Gravel Company's Favor

A switch engine, operated by the Fountain Sand & Gravel Co. of Pueblo, Colo., was declared to have had the right-of-way and a suit for damages was denied in court at Pueblo recently.

District Judge John H. Voorhees dismissed the case upon motion of defense attorneys who contended that, under a supreme-court ruling, it is the duty of a motorist to take caution in crossing a railroad track. The judge decreed that such caution had not been shown by J. W. Short, the plaintiff, who sued for $2,700 damages.

Army Engineers Attend P.C.A. Control Course

Forty-three engineers representing seven offices of the United States Army Engineers Corps attended a course in field control of concrete conducted in the Portland Cement Assn. Laboratory at Chicago last month. This was the fifth consecutive year that the course has been held for engineers in charge of flood-control and navigation construction projects on the Mississippi and its tributaries. The course consisted of lectures, round-table discussions and laboratory practice dealing with concrete mixtures designed for use in flood-control and navigation structures.

Wellston Changes Name of Cement Subsidiary

The Wellston Iron Furnace Co., which has been operating a cement plant at Superior, O., for many years, has changed the corporate name of the cement concern to Superior Cement Corp. F. R. Kanengeiser who was recently made president, made the announcement.

The Superior plant utilizes a large part of the furnace-slag output of the steel industry in the manufacture of Portland cement.

Huge Ferrysburg Plant Starts Washing Gravel

Operations have been started at the new sand-and-gravel plant of the Construction Materials Co., Chicago, located across Lake Michigan at Ferrysburg, Mich., near Grand Haven.

The plant is said to be equipped to wash, screen, and store 1,250 tons of material per hr. Ten storage silos, each 84 ft. in diameter and 60 ft. high have a capacity of 20,000 tons each. Galleries above the silos are 100 ft. above the ground level. More than 100 electric motors with a combined horsepower of 3,000 are used.

California Cement Firm Holds Employees' Outing

Nearly 500 persons attended the annual barbecue and picnic for employees of the Santa Cruz Portland Cement Co., held May 22 at Laguna, Cal. The affair was the third to be staged by the company and was featured by a program of sports events during the afternoon. Employees, their families and friends enjoyed the outing.

K. C. Material Co. Will Install Another Plant

The Kansas City Material Co., W. M. Spencer, president, 144 N. Kentucky Ave., Kansas City, Mo., plans the installation shortly of a crushing and washing plant of 2,000 tons daily capacity.

Canadian Asbestos Co. Makes Change in Name

The Canadian Asbestos Co. of Toronto, Ont., has changed its name to Canadian Asbestos Ontario, Ltd. The address remains the same as formerly, being 14 Front St. E., Toronto.

Company Gets Permit to Dredge in Mississippi

The Star Coal & Improvement Co. of Davenport, Ia., has been authorized to engage in the production of sand and gravel, utilizing Mississippi River deposits. The company plans to purchase boats, barges, dredging equipment and the necessary storage facilities and expects to begin operating during the summer. B. H. Kelley is president and P. L. Kernan, secretary. It marks the initial entry of the firm into the gravel-producing field.

British Columbians View Gilley Bros. Operations

A group of aggregates producers and material dealers from Victoria and Vancouver, B. C., made a tour of inspection of the new Mary Hill sand-and-gravel plant and other operations of Gilley Bros., Ltd., of New Westminster, B. C., recently. The visit occupied an entire day and luncheon was served at the company's quarry at Pitt River.

Included in the party, which was conducted over the operations by G. Emerson Gilley, were: F. J. McCleery of McCleery & Weston, Ltd., Vancouver; Norman Jessiman, British Columbia manager for Gypsum, Lime & Alabastine, Canada, Ltd., Vancouver; William Hyslop and Byron Johnson of Evans, Coleman & Johnson Bros., Victoria; H. P. Simpson, Sr., and H. P. Simpson, Jr., of the Producers Sand & Gravel Co., Ltd., Victoria; William Bone and Fred Foster of Evans, Coleman & Evans, Ltd., Vancouver.

Inland Lime & Stone Co. Operating at Capacity

Full-time operations are in progress at the plant of the Inland Lime & Stone Co., located at Port Inland, on the shores of Lake Michigan near Manistique, Mich. A night shift has been put on in the crushing and screening departments, a total of 135 men being employed.

Whether operations will continue throughout the season depends entirely upon the demand, according to A. J. Cayia, superintendent. Much of the stone is shipped by boat to the plant of the Inland Steel Co. at Indiana Harbor, Ind., for fluxing purposes while considerable quantities are also sold for road building and general construction work.

Rebuild Cement Packing House Destroyed by Fire

Work of rebuilding the storage-and-packing plant of the Consolidated Cement Corp. at Cement City, Mich., which was destroyed by fire last month, has been started, it is reported.

A pneumatic conveying system will be installed to carry the cement from the finish-grinding building to the storage silos, replacing the old overhead carrier system which was burned. Some of the packers were saved but others are to be replaced. Nearly 600,000 paper and cloth sacks were consumed by the blaze.

Missouri Stone Concern Acquires Fourth Quarry

The Arnold Stone Co., of Cape Girardeau, Mo., has acquired another quarry and plant at Grays Point, Mo., from Brennan McNichols. The company now has four quarries, the other three being located at Ste. Genevieve, Mo., Neely's Landing, Mo., and Cape Girardeau. Alvin Cotner is president; Peter H. Deimund and John Cotner, vice-presidents; and Linder Diemund, secretary.

Completes Gravel Plant on Isle in Puget Sound

Construction of the Puget Sound Tug & Barge Co. gravel plant and pit on Hat Island has been completed and the $75,000 plant has started preliminary operations, George Cary, Seattle, vice-president of the company, announces.

Work on the plant, which is located on Hat Island, directly opposite Everett, Wash., in Puget Sound, was started early in January.

Fourteen hundred cubic yards of material can be handled in an 8-hr. shift. Bunkers have a storage space of 5,000 cu.yd.

Two Workmen Injured in N. Y. Gravel-Pit Blast

A blast in the sand-and-gravel pit of the E. V. Carey Construction Co. at Rensselaer, N. Y., designed to loosen a clay-bound portion of a bank, seriously injured two workmen recently. Charles H. Bernard, 31, was struck by flying stones and was taken to a hospital, while Harry Vander Zee, 27, was bruised and suffered severe lacerations from rock released by the shot.

Lake Vessel Transports Stone for Highway Jobs

The self-unloading boat *Fred Green* operated by the Northwest Sand & Gravel Co., is engaged in freighting crushed stone from Sturgeon Bay, Wis., to Menominee, Mich., where the material is loaded on railroad cars for shipment to Crivitz, Wis., where an extensive program of highway construction is in progress.

The Santa Clara Sand & Gravel Co., whose main plant is located at Montalvo, Cal., has taken out a permit for erection of sand and stone bunkers, at 627 E. Montecito St., Santa Barbara, Cal., to cost about $1,500.

Joker in Law Lifts Curb on Truck Use

HITS RAILROADS IN VIRGINIA

A joker in Virginia's new motor-vehicle law apparently gives contract truck carriers practically unlimited privileges to compete with the railways upon highway routes not covered by regular freight routes.

Some transportation authorities see in the new law, as revived by the general assembly of 1932, the final death blow to short haul traffic in Virginia, since it lets down most of the statutory bars against private truck competition.

Hitherto freight certificates were limited to "applicants holding themselves out for private employment only for the transportation of specific loads or commodities for a single employer on a single trip."

This limitation has been dropped. The new section provides as follows: "The director, division of motor vehicles, may issue appropriately designated tags for property-carrying vehicles to applicants holding themselves out for private employment, and who agree that they will not operate upon a regular schedule, nor solicit nor receive patronage along the route or between cities, towns or locations served by motor vehicle carriers operated under certificates granted by the state corporation commission.

Gravel Plant Using 30 Trucks to Haul Product

Thirty motor trucks have been put in service by the Columbia Sand & Gravel Co. to haul material from the company's plant located near Redmond, Wash., to two important highway-construction projects in that vicinity. As a result, the plant is a beehive of activity and operation has been pushed to capacity.

A new belt-conveyor and storage-bins were installed at the plant recently. Approximately 1,200 cu.yd. of material is being transported by the trucks each day to the site of the paving operations. Most of the excavating at the pit is done by Barber-Greene equipment.

Liquidation of Albany Company Is Completed

Liquidation of the Albany Crushed Stone Corp. of Albany, N. Y., has been completed and stockholders will share in the $79,086 proceeds, following the final order of dissolution filed by Supreme Court Justice Bliss at Albany.

Preferred stockholders in the company will receive par value of $100 per share for each share held, while the common stockholders will receive $20.72 per share.

Editorial

The Price Situation Improves

JUDGING by the frequency of profitless-price quotations, there are still many business men who have not yet learned the folly of the practice. Undoubtedly the most cogent reason against selling below cost has been overlooked, although many powerful and valid reasons have been assigned and either opposed or defended. These men have failed to see that the practice has the effect of robbing the future to care for the present and that the results of to-day's price-cutting will be felt on all the business done in the future.

The need for the materials of construction is a fairly constant thing. Population increases at known rates, human desires grow apace, and the ability of the populace to buy, except in days like these, advances proportionately. Periods of slackened business, like the present one, do not disprove the contention; they offer merely temporary interruption to a progress that is inevitably upward. Every business is faced, therefore, with an expanding outlook, not to-day or next year only, but for as long a time in the future as anyone has a reason or a right to look. No one alive to-day will live to see any lasting retrogression in the standards of living. As much might with probable truth be said of many generations to come, although as most of us are concerned with the present and only a small portion of the future we need not feel worried about generations two or three degrees removed. Like our own and past generations, they will be able to take care of themselves.

So no one need fear for the stability of the future market for construction materials or any other form of commodity. The natural insatiability of human desires will not only prevent any permanent decline in the standards of living but it will insure a continuous raising of those standards to and beyond heights of which we can conceive. In short, the market for our commodities is made, and, through the operation of natural causes, will continue to grow. That being the case, is not it folly to press that market by means of profitless selling, when its needs can not disappear, although they may be deferred?

It should be evident to everyone who seriously considers the situation that a sale made to-day instead of to-morrow because of a price concession is a sale taken away from to-morrow when a price concession might not seem as necessary. Price concessions do not increase the amount of money spent for general commodities, they do not increase consumption in times like these (except in very rare instances), they do not improve the profit situation among business men. They may lead some buyers who would normally purchase next week to order this week instead, but if this advance in purchasing time is obtained at the cost of the profit on the sale, where is the gain? Where the profit on a sale is less than the cost of borrowing the amount of the selling price for the time represented by the advance, it is folly to cut prices in order to accomplish the ends for which credit institutions operate. Yet that is being done every day in countless thousands of cases, where a dollar to-day is considered to be worth more than two dollars a week hence. It would be hard to conceive a more effective way of deflating the value of money.

By pressing the buyer to take at a reduced price to-day what he will normally want to buy a little later and for which he will then be willing to pay a profitable price, the seller generally does himself a grave damage. He does not increase the sum total of consumption of his goods; he merely hurries the purchaser into buying sooner. And this happens only in those cases where the buyer is able and anxious to take advantage of the seller's extremity. That this does not often occur is amply demonstrated by the failure of most price-cutting campaigns to accomplish the ends sought.

The producer who increases his production to-day because of the artificial and temporary stimulus he may give to his customers' buying urge through profitless prices, will be forced to reduce his production proportionately later on, when the buyers who would normally then be ready to buy at profitable prices are out of the market because their needs have been satisfied. The needs of buyers are fairly definite; they can not be expanded and multiplied indefinitely; they are limited by the buyers' ability to consume and to pay. The man who owns one radio may be led to buy another simply because the seller offers it to him at less than cost and because a real or imaginary use for the second set can be shown him. But the products of our industries are not sold on that basis. The builder of a structure can not be induced to buy more material than he needs simply because it is offered to him at a price below cost. States can not be led into building unusable highways or other unnecessary public works simply because the materials entering into their construction can be purchased more cheaply than formerly. These facts constitute the tragedy of selling at cut prices, especially in our industries. Our markets have been very definitely limited by physical and financial conditions entirely beyond these industries' control.

States would carry on their needed work if materials sold at twice their present prices. The policy of selling on a profitless basis has encouraged public buyers as it has private buyers to insist on lower and lower prices. The seller has inaugurated a philosophy of buying that has thrown his business into a declining sickness, from which he seems to be unable to recover it. Sellers who deplore the buyers' habit of "chiseling" should consider to what extent they themselves are responsible

for the practice of continually demanding lower prices for commodities of every kind. Certainly it was not begun by buyers, who for years found themselves in a sellers' market and paid what they were asked and yet did not seem to check their wants or their purchases. The fact that business is not now in a sellers' market is due more to what business has done than to what buyers have done. Most of the refusal to buy which makes the present market a buyers' market is the result of the belief—engendered by the sellers' policy of recurrent price reductions—that prices will fall still farther and that the buyers' needs can advantageously be deferred until what buyers believe to be the bottom in prices will have been reached.

Recently there has been a firming tendency in prices in our industries and, while the net gain may not have been great when measured in dollar volume, the benefits of a psychic nature have been incalculable. Already producers are feeling better and increasing numbers of them show this betterment of feeling by a desire and a readiness to buy. The results are becoming more noticeable on the order-books of equipment manufacturers, many of whom report a decided improvement in recent weeks, and they will be still more evident in the cost records of producers when their new equipment begins to function.

Price-cutting is on the wane and that, in our opinion, is the most favorable sign we have seen. It indicates a growing realization that price concessions will not bring business out of its present troubles but that, on the contrary, they only increase the difficulties and postpone recovery. As long as business men were deceived by the idea that the test of success was volume and not profit, there was little chance of checking the price-cutting orgy. It is becoming increasingly obvious, however, that a profitable small business is preferable to an unprofitable large one and that profit and not volume is the proper criterion of success. This fact, incidentally, often explains the superior ability of small businesses to weather the storm of business depressions. Some of the small business man's ideas —among which is the absence of a desire to attain monopoly proportions—could be profitably adopted by bigger business which, in spite of its supposedly superior ability and opportunities, has been more seriously affected by present conditions and more seriously infected with the price-cutting fever.

The Social Trend in Management

SIGNIFICANT developments are taking place in the field of industrial economics, especially as regards the social outlook of business men. What centuries of Christian teaching failed to do is being accomplished by the lessons of adversity. The rugged individualism born of the establishment of private property and the coming of the industrial revolution is making way for a new attitude of social responsibility.

Like no other similar period of economic stress, the present is showing us the interdependence of all the different and heretofore conflicting classes of society; it is breaking down the old class lines and disclosing the essential unity of society. Economic stress is a social ailment which spreads like any other infectious disease from one social stratum to another. In spite of all the class distinctions of the past, in spite of all the real and artificial marks of separation, there has been no method of prophylaxis or scheme of isolation that would prevent the spread of economic disaster from group to group. Society is an organism, to every part of which an infection set up in any other part is transmissible, and the health of the whole can be no greater than that of its sickest part.

This truth, when first discovered and realized in a broad sense, doubtless caused various degrees of mental pain to different sections of society, but like other truths it is not nearly as unpalatable as it at first seemed. "Society in shipwreck is a comfort to all," and "It is a consolation to the wretched to have companions in misery." The adversity of the moment has softened our hearts and cleared our minds. Every man is beginning to feel some of the responsibility of being his "brother's keeper."

Business men are taking a new and more enlightened view of the social aspects of business—its dependence on society for profits, its compensating obligation to society in providing economic security for the individual. They are discovering that business can prosper only as society prospers, that questions of low wages, bad working conditions, unemployment, old age, accidents, sickness, and the like are problems not only for the victims of those conditions but also for those out of whose business they arise. This is the new view; it is also the sound view, the profitable view.

American business men are rising to this new sense of social responsibility and they are seeking and discovering ways in which the obligation can be discharged. They are learning more of the mutual importance of all the groups with which they have contact—workers and customers as well as stockholders—and they know more about the ways in which the losses and hurt borne by one group pass quickly and unfailingly to every other group in turn. They are finding, too, that they can shape their policies on the basis of this new knowledge, that they can assume and discharge this responsibility to society (as far as they are able to see it), without destroying or in any way impairing the competitive stimulus of business, that the newer attitude is, in fact, more profitable as well as more intelligent than the exaggerated egoism of the past. Coöperation is more wholehearted and, therefore, more helpful than formerly; increased mingling has brought increased understanding. In industrial management to-day the trend is in the direction of wider recognition of this social interdependence and a more general acceptance of its responsibilities. Leadership is falling more and more into the hands of executives who are animated by a spirit of social service as well as one of commercial success and who are determined to make constructive contributions to social progress.

Cement Plant in Michigan Adds Modern Slurry Filters to Cut Costs, Raise Output

Waste-Heat Boilers, Additional Storage Units Also Erected at Aetna Operation Near Bay City

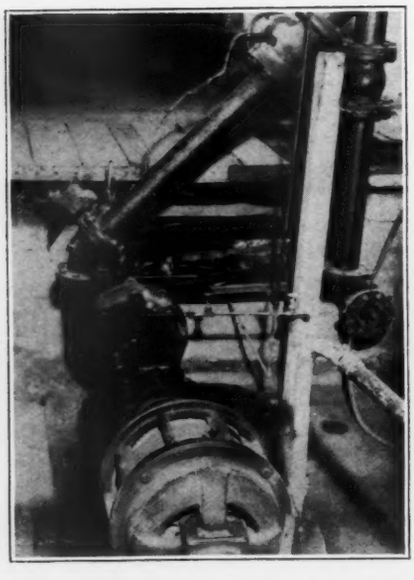
Plant of the Aetna Portland Cement Co. with the recently-completed bank of storage silos in the foreground.

THE cement industry has often been criticized because of the large number of plants which, in spite of the fact that they have not been modernized, are still producing cement in competition with plants having more modern facilities. This fact has been seized upon by promoters of new cement plants as economic justification for the erection of new plants in an industry that is already overequipped. Where, as often is the case, the cost of the existing plants has been written off the books, there is a tendency to view with complacency the fact that they are inefficient producing units, chiefly because, operating with reduced overhead, they are able to produce their products very cheaply. Such plants have unquestionably been a large factor in creating and maintaining the price-cutting situation which has been so notorious within the last few years.

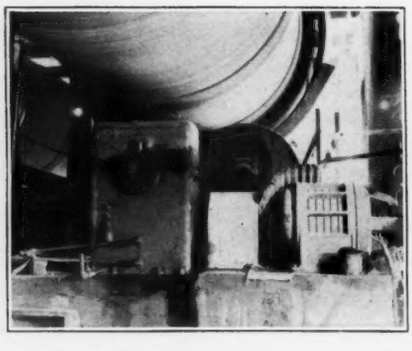
Here and there, however, progressive cement producers have seen the wisdom of modernizing such of their plants as may have failed to keep step with progress. In such cases, it has appeared to be wiser to improve the existing facilities and to place these plants on a par with the best modern design and construction. In the case of the Bay City plant of the Aetna Portland Cement Co. this task has been accomplished in a thorough-going manner. No phase in the production of cement at the plant has escaped the program of renovation and improvement. The original circular-line production lay-out lent itself admirably to the introduction of betterments and this feature has made the plant comparable with the best plants that have since been built. At the instigation of an astute management and under the guidance of experienced practical cement men who were given the authority to provide the best, the plant represents to-day an exceptional example of the success with which older types of equipment and older methods can be brought into line with the most advanced principles of design and operation.

The Bay City, Mich., plant of the Aetna Portland Cement Co. originally went into operation in July, 1923, as a wet-process unit with one kiln. The second kiln and its accompanying equipment were installed in 1924. Improvements of the plant were made from time to time to keep up with the progress of the industry. In 1930 a comprehensive improvement program, which called for the expenditure of about $300,000, was decided upon. One of the first steps was the erection of a second cement-storage unit which was completed in the summer of 1930. Waste-heat boilers had already been installed. In the late autumn of that year slurry filters were purchased. The necessary changes were made and the filters put in operation May 15, 1931. These alterations were made in a month during the annual shut-down.

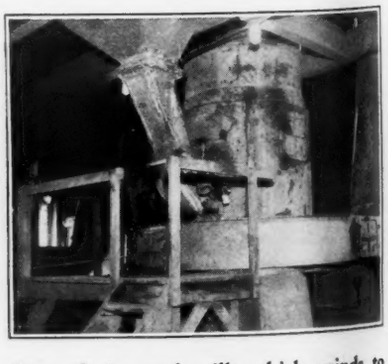
An interesting feature of the filter installation was the absence of mechanical difficulties and the speed with which the expected results were obtained. Credit for this is due largely to the systematic and careful manner in which the highly-trained operating force under O. A. Dibble, general superintendent, studied the new problems presented



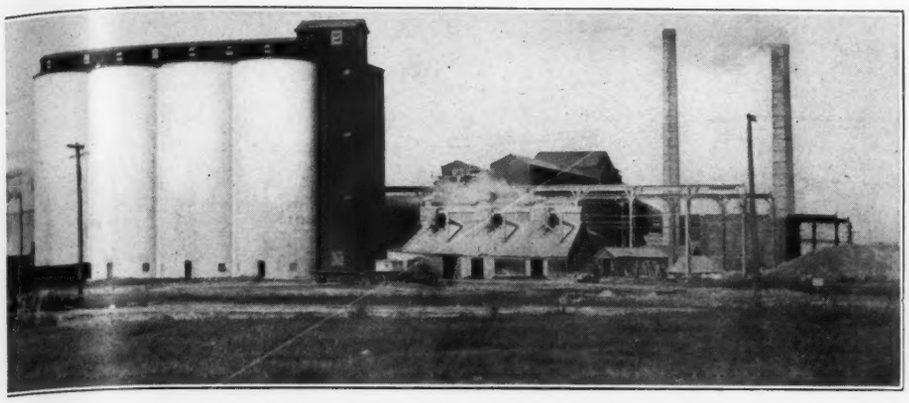
Four-inch pump which recirculates slurry between tanks.



Speed-reducer drive on one of the rotary cement kilns.



One of the coal mills which grinds to extreme fineness.



At right — Traveling gantry cranes unloading coal from ship to storage piles at the plant.

by the filters and met them one by one. This was done without the usual haphazard irregular operation which is so wasteful of time and money. The result was that within three months after starting the filters the expected fuel rate was obtained without serious mechanical difficulty or interruption to continuous production. The filters themselves and the men who coöperated with the cement company in installing them must also be accorded a large part of the credit. The filter installation resulted in a large reduction in fuel consumption and a large increase in output.

Although called the Bay City plant, this unit of the Aetna company's facilities is actually located in the village of Essexville about 3 mi. east of downtown Bay City. The plant site is at the mouth of Saginaw River only 1 mi. from Saginaw Bay. Connection to four railway systems and waterways gives the company unusual facilities for the receipt of raw materials and for the shipment of cement.

Sampling and Testing.—One of the features of this plant is the great care exercised in testing and blending the raw materials. The stone is fairly uniform and is well mixed by the processing and handling it receives at the quarry and in its storage and reclamation at the plant. The addition of clay in liquid form at the raw-grinding mill and its subsequent blending insures a perfect mix. Samples are taken at the raw-grinding mill every hour and are tested for their moisture and calcium-carbonate content. The slurry is sampled at the kiln-feed tank at 3-hr. intervals. The clinker is sampled and tested every 2 hr. on leaving the coolers and the cement is sampled at the discharge end of the finish-grinding mills at the same intervals.

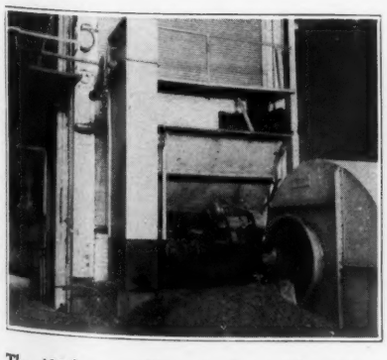
Typical analyses of the clay and limestone used at the plant and of the clinker and cement follow:

	Clay	*Stone*	*Clinker*	*Cement*
SiO_2	54.50%	1.0%	21.40%	21.10%
Al_2O_3	13.01	0.5	6.41	6.07
Fe_2O_3	6.91	0.3	3.31	3.05
CaO	10.50	....	66.40	64.32
MgO	3.99	3.0	2.52	3.24
$CaCO_3$	....	92.0	....	....
Sulphur	....	....	....	1.90
Loss on ignition	11.04	3.0*	....	....
Totals	99.85%	99.8%	99.88%	99.68%

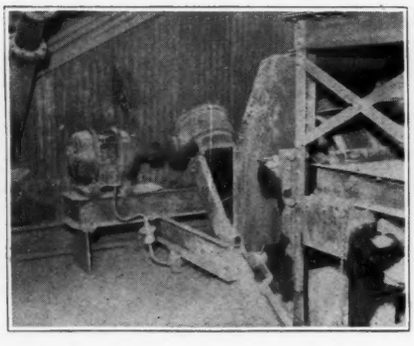
* Includes a small percentage of organic matter.

The raw mix used averages about 80 per cent. limestone.

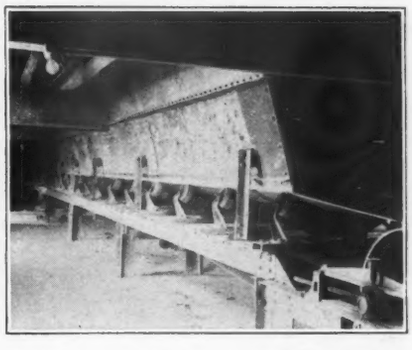
Raw Materials.—The quarry supplying the limestone for the plant is located at Rockport, 12 mi. east of Alpena, Mich. The rock is Dundee limestone, typical in this part of the state. The quarry has a 50-ft. face and there is no overburden. Drilling is done with Armstrong well-drills and the stone is broken down in single-row bank-shots using Cordeau-Bickford safety fuse. The stone is crushed and screened to size and is loaded into boats for shipment to Bay City.



The 400-hp. auxiliary boiler with stoker and fan.

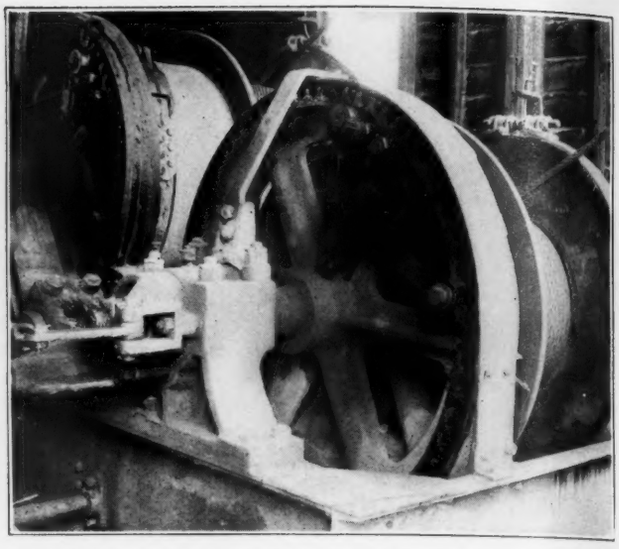


Screw feeder at end of conveyor feeds filter cake to kiln.



Belt-conveyor which carries filter cake to the screw feeder.

Draft fan and variable-speed drive on coal feeder at kiln.



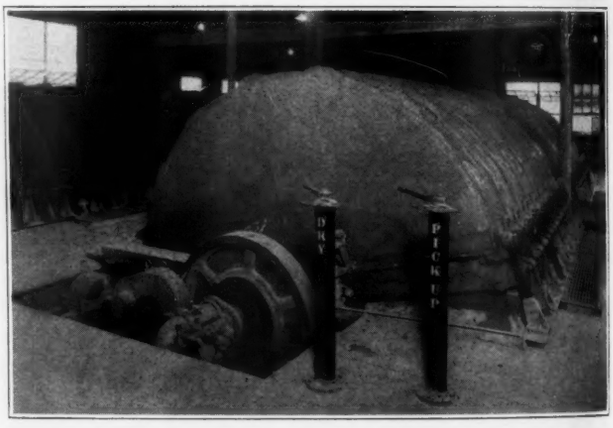
Two-drum hoist which operates the 3-cu. yd. stone scraper.

The steamer *Aetna,* when it arrives at the plant with its cargo of 2,750 tons of stone, is moored at the 750-ft. dock and is unloaded by two Brown-hoist traveling gantry cranes fitted with 3-cu.yd. clam-shell buckets. These cranes are of the type commonly used in steel-mill yards and docks and unload a cargo of stone in about 16 hr. Each crane is a self-contained unit, its clam-shell bucket discharging to a hopper. A pan-conveyor feeds an inclined belt-conveyor which discharges the material to storage wherever the crane may be working.

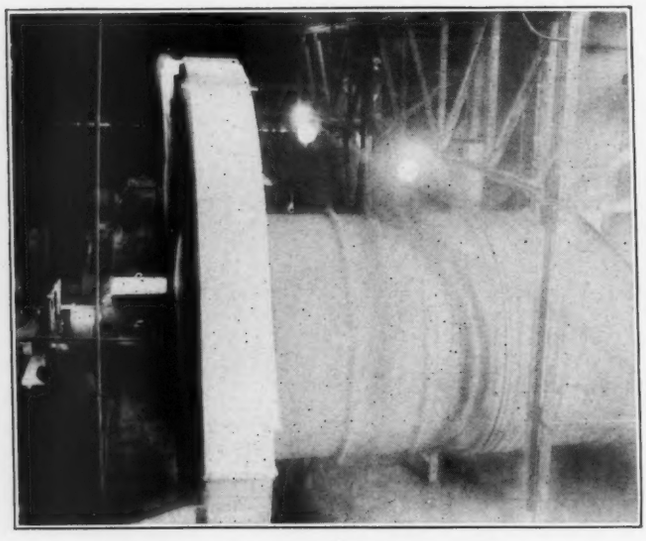
An overhead traveling crane rehandles the stone to open storage. A 3-cu.yd. Sauerman Crescent-scraper system alongside the stone storage gives added capacity, the total stone-storage capacity being about 90,000 tons. The 3-ton Whiting overhead crane handles a 2-cu.yd. Kiesler clam-shell bucket and operates on a crane-way with a 100-ft. span and a length of 800 ft.

The Sauerman scraper is operated by a Clyde 2-drum hoist which is silent-chain-driven by a 150-hp. G.E. motor. This is located in the base of a control tower, which is high enough to give the operator an unobstructed view of all operations. The hoist is controlled from the top of the tower by a series of levers. The head-frame of the scraper system is of steel. Roebling cable is used exclusively.

The overhead crane feeds the stone from storage to two round-bottom steel mill-feed bins which are 18 ft. deep and 20 ft. in diameter. These discharge by gravity to the rocker feeders of two 7-ft. by 26-ft. Allis-Chalmers 2-compartment raw-grinding mills, each of which is driven by a 500-hp. G.E. super-synchronous motor.



Bank of slurry filters in the plant.

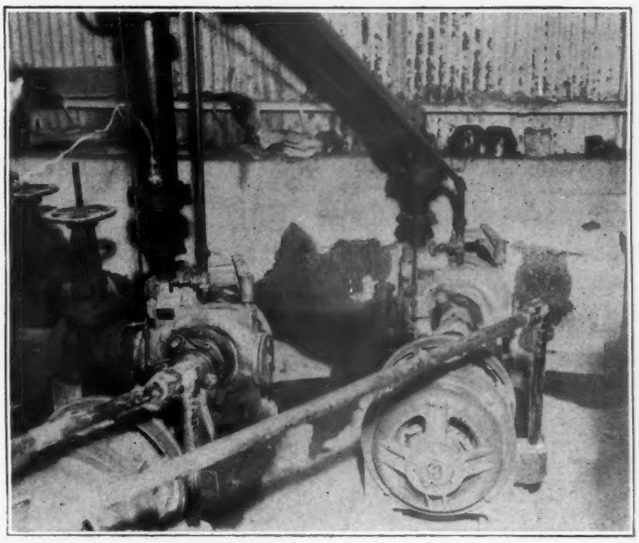


Two of the raw-grinding tube-mills.

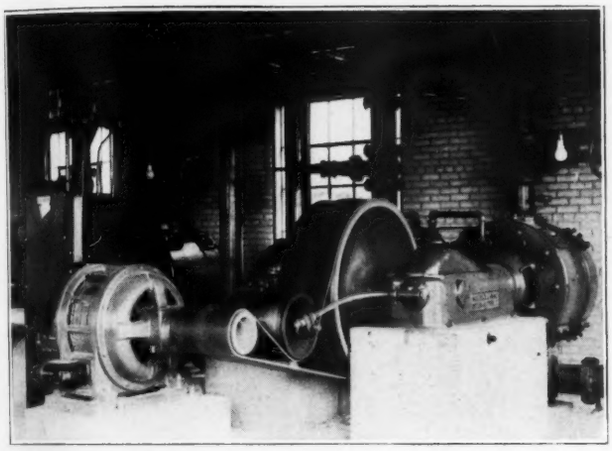
Clay is unloaded from railway cars at the plant by the same overhead crane used for handling the stone. This either distributes the material to storage or feeds it to a hopper alongside the stone hoppers. The hopper discharges directly to an Allis-Chalmers 30-ft. wash-mill by which sand and gravel or other foreign material in the clay are separated and discharged to a waste pile. The clay slip, with a moisture content of 60 per cent., is pumped by a Sullivan Machinery Co. air-lift pump to a clay-storage tank which is 30 ft. in diameter and 20 ft. high. Two 4-in. Morris centrifugal pumps discharge to two Ferris-wheel feeders which carry the clay slip to the raw-grinding mills. The rate of feed is changed as required by adding or removing

buckets from the feeders and by their variable-speed motors.

Slurry Handling.—The primary compartments of the raw-grinding mills operate in closed-circuit with two double units of 4-ft. by 5-ft. Hum-mer single-deck vibrating screens. The material discharged from the first compartments of the mills is taken by two bucket-elevators to the two sets of screens. The material retained on the latter goes back to the feed end of the mills for regrinding, while the slurry passing through the screens goes back to the second mill compartments. These discharge the finished slurry to a sump, from which a 4-in. Morris centrifugal pump feeds it to six 30-ft. by 30-ft. slurry-storage tanks. For correction purposes another 4-in. Morris pump circulates the slurry between five of these tanks, and feeds the corrected slurry to the sixth tank which is used as



Two 3-in. pumps which feed slurry from the storage tanks to the kiln feeders.



Vacuum pumps operated in connection with the slurry filters.

a feed-tank. Two 3-in. Wilfley pumps pass the slurry from the feed-tank to two Ferris-wheel feeders which control the flow to the slurry filters.

Slurry Filters.—The filter installation consists of four 12-ft. 6-in. diameter, 8-disk American filters (2 filters per kiln) built by Oliver United Filters, Inc. Each unit has a filter area of 1,600 sq.ft. and is driven by a variable-speed direct-current motor giving a filter-speed of from 4 to 16 min. per rev. as desired. The vacuum is furnished by two Ingersoll-Rand 24-in. by 24-in. by 10-in. Imperial Type 10 vacuum pumps, each of which has a moisture separator and is belt-driven by a 75-hp. G.E. induction motor. A third pump is used as a stand-by.

The filter-cake, which has a moisture content of about 18 per cent., drops from each filter unit to a horizontal belt-conveyor below. Each belt is driven by a 3-hp. G.E. motor through a Foote spur-gear speed-reducer. Each conveyor discharges the cake to a feed-screw which carries it directly into the kiln. The feed-screws are driven by 10-hp. G.E. motors through Foote worm-gear speed-reducers.

Kilns and Coolers.—The two Allis-Chalmers 10-ft. by 175-ft. rotary kilns are driven by 60-hp. variable-speed alternating-current G.E. motors through Cleveland worm-gear speed-reducers. They discharge directly into two Allis-Chalmers 8-ft. by 60-ft. rotary coolers, which are equipped with Vanderwerp air-cooling systems and are belt-driven by 25-hp. motors.

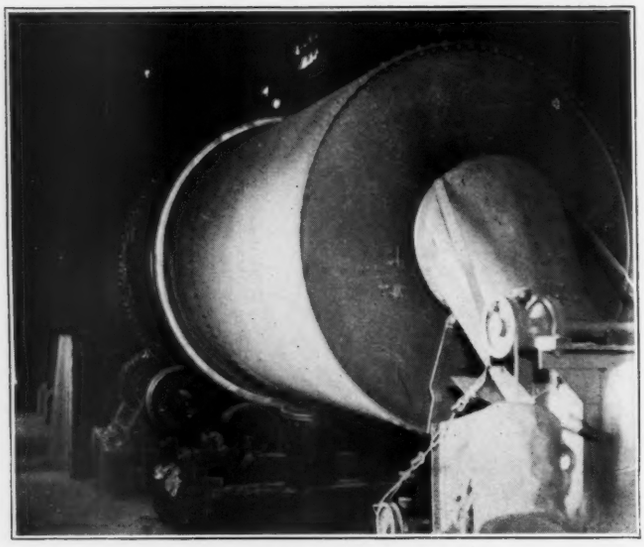
The Vanderwerp cooler is a comparatively new development and this installation is one of the first made in the cement industry.[1] The system involves

[1] See Catlin (A. W.). *The Vanderwerp Recuperator as Applied to the Rotary Cement Kiln.* PIT AND QUARRY, XXIV, No. 5, p. 31, June 1, 1932.

Looking between the filters toward the control equipment.

Rack for cleaning the filter segments.

the blowing of a current of cool air through a sealed ring around the coolers and through a series of perforated plates into the clinker at the bottom of the mills. It is so arranged that the air blows only through those bottom plates which are under the clinker so that the greatest possible cooling efficiency is obtained. Air for both coolers is provided by a No. 9 Sturtevant fan. Cooled by this system, the clinker leaving the cooler has a tempera-



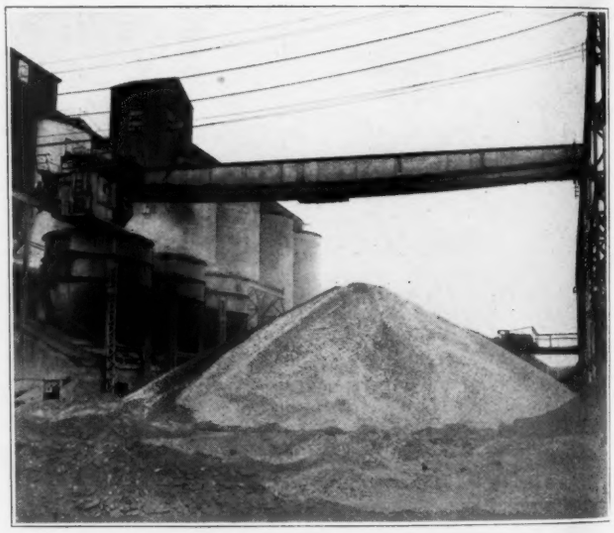
The indirect-heat rotary coal drier.

ture of only about 200 deg. F. The direct contact of the air with the hot clinker also increases the temperature of the air passing from the cooler to the kiln. This system is manufactured by the Manitowoc Engineering Works.

These coolers have means for automatic sampling of the clinker at their discharge ends. A small 3-in. by 4-in. bucket is placed inside the end of each cooler in such a way that it picks up a handful of clinker with each revolution of the cooler. When the bucket reaches the top of the cooler it discharges by gravity into a 2-in. angle-iron sloping trough, which is open for 1 ft. and is inclosed for the remainder of its length by the attachment of a shorter inverted angle-iron which is welded on the top of the longer bottom one. From this trough the clinker is discharged to a container from which samples are drawn every 2 hr. for testing purposes. This system was devised by Paul Bischoff, chief chemist, and has been operating very satisfactorily.

The clinker passes from the coolers to small bucket-elevators which discharge it to open storage. Gypsum is added to the clinker at the boots of the elevators. This method has been used satisfactorily for the past 8 yr. and there are only slight daily variations in the gypsum content. The clinker is distributed to storage by a Whiting 3-ton overhead crane fitted with a 3-cu. yd. Kiesler clam-shell bucket. This storage is separate from the clay and stone storage and is 100 ft. wide and 200 ft. long. The crane supplies 3 mill-feed bins of the same size and type as those which feed the raw-grinding mills. These discharge by gravity to two rocker-feeders which supply the three Allis-Chalmers 7-ft. by 26-ft. Compeb finish-grinding mills. The cement is ground to a fineness of about 90 per cent. through 200-mesh. Each of the finish-grinding mills is connected to a Clark cyclone dust-collector.

The finished cement is discharged to a screw-conveyor which feeds two bucket-elevators, one for each row of storage-silos. The elevators discharge



Overhead crane which handles clinker and gypsum to the mill-feed bins.

to screw-conveyors which are above the silos and distribute the cement to storage.

The 3-cu. yd. scraper at the stone-storage piles.

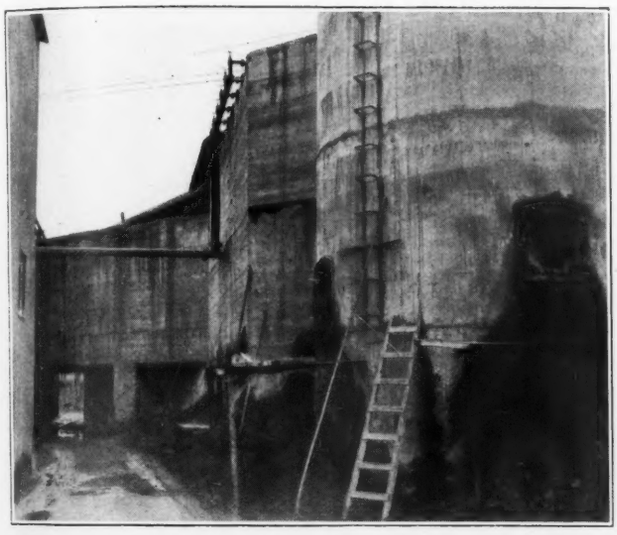
Results of Filter Installation.—Before the filter installation was made the slurry had a moisture content of about 35 per cent. In order to increase the capacity of the raw-grinding department to meet the greater demand the slurry moisture was increased to over 37 per cent. and the Hum-mer screens were installed in closed-circuit. These changes increased the raw-grinding capacity about 33 per cent.

The filter installation resulted in an immediate increase of about 23 per cent. in the capacity of the kilns. A few minor improvements made in the raw-grinding department during the winter have brought this up to over 30 per cent. with a corresponding decrease in fuel consumption. The

amount of steam generated by the waste-heat boilers has been increased 12 per cent. by the filter installation. These boilers now furnish enough power to operate the entire plant.

Gas-Washing.—After leaving the boilers, the waste gases pass through a gas-washer which, together with the original plant and all the subsequent improvements, was designed by S. Firestone, consulting engineer. This is in the form of a concrete passageway connecting the boilers to the kiln stack.

The filter installation had interesting results in connection with this washer. Previous to the installation of the filters only small amounts of dust were deposited in the kiln housing and boilers, but so much accumulated in the washer that it had to be cleaned out frequently. Now considerably more dust is recovered at the kiln housing and boilers,



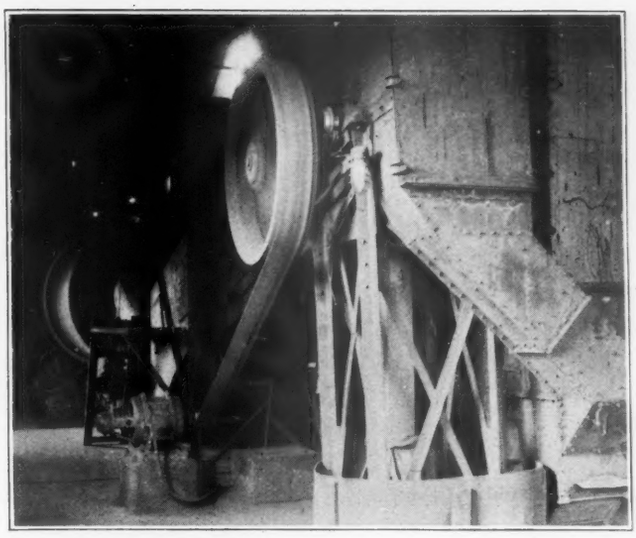
The concrete waste-gas washer between kilns and the stack.

but the washer needs to be cleaned out only once or twice a year. This has eliminated the expensive and troublesome shut-downs of the kiln that were formerly necessary.

Storage, Packing and Shipping.—The storage unit consists of two separate rows, each comprising 4 concrete silos. One row was built at the same time as the plant and consists of 4 silos, each of which is 30 ft. in diameter, 70 ft. high and 38 ft. in a center-to-center distance from its neighbor. The second row of silos was built in 1930. Each of these is 36 ft. in diameter and 80 ft. high. The units have a total capacity of 150,000 bbl. of cement and were erected by the Macdonald Engineering Co.

Each of the four new silos has six gates which discharge through chutes to four screw-conveyors, one for each silo. These conveyors are set at right angles to the row of silos and feed to the two collecting screws under the four old silos. The collecting screw-conveyors feed two elevators which discharge to screen screw-conveyors over the packer-bins in the pack-house.

The four 4-tube Bates packers on the first floor are arranged in a row along one side of the building. An unusually flexible arrangement of belt-



Coal-weighing device with drier in background.

conveyors allows loading either cars, trucks, or boats or all three at one time. One of the packers discharges to a short horizontal belt-conveyor, which is reversible and can discharge at one end to cars or trucks and at the other end to a longer horizontal belt-conveyor which serves the other three packers. This is also reversible and can feed the short conveyor at one end for loading cars or trucks. Another short conveyor, set perpendicular to it, can also feed the trucks. At its other end the long conveyor can discharge either to another short conveyor for loading cars or to a series of conveyors for boat loading.

The two short loading conveyors are movable and can be removed when not in use. When loading

Special air-cooler connection to one of the rotary clinker-coolers.

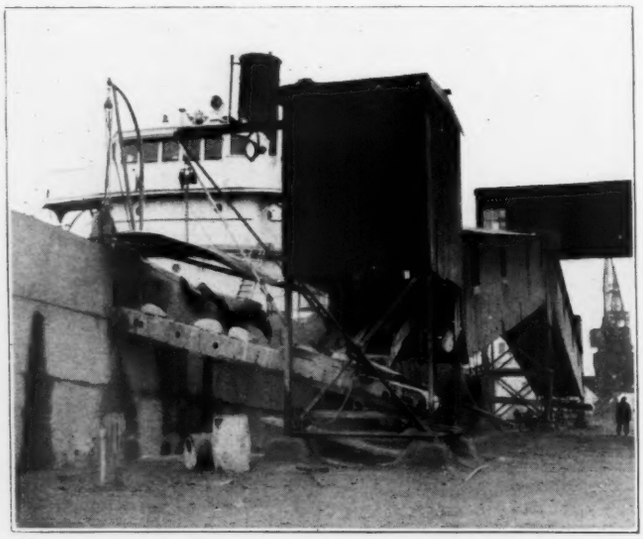
boats the car-loading conveyor at the end of the long packer conveyor is raised, allowing the sacks to drop on an inclined slat-conveyor set at right angles to it. This discharges to a horizontal belt-conveyor running in an inclosed gallery to the dock, where it splits its discharge to two inclosed and inclined gravity conveyors placed at right angles to it. These in turn discharge to two portable inclined

Truck and trailer being loaded at the plant.

conveyors which feed the hold of the boat through special openings at each end of the hold.

The flexible loading arrangement allows part of or all the pack-house capacity to be loaded in any direction. With all four packers in operation 16 bbl. of cement per min. can be loaded. Arrangements are also made for loading bulk cement in cars or trucks through a flexible spout.

The second floor of the pack-house is used for sack storage and repairs. There is a bag-tier,

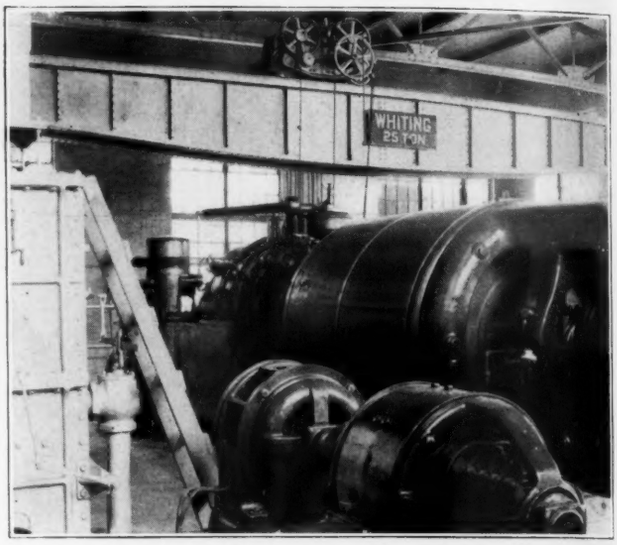


Sacked cement being conveyed to hold of ship.

sewing-machine, bag-cleaner, sorting table, etc. Bundles of good sacks drop through a chute to the first floor for packing. The dust from the sack-cleaner is discharged to one of the elevators, joining the stream from the storage-silos. Spillage from the packers is fed by a screw-conveyor to the cement elevator.

Coal.—Coal is unloaded from boats at the dock to open storage by the same two traveling cranes which handle the stone. It is distributed to storage or rehandled to a hopper by an overhead traveling grace. The hopper discharges by gravity to an elevator which feeds a Ruggles-Cole 7-ft. by 45-ft. indirect-fired rotary drier. The dried coal passes over a Merrick Weightometer on a short inclined belt-conveyor, which has a Dings magnetic-separating head-pulley that removes all the iron from the coal.

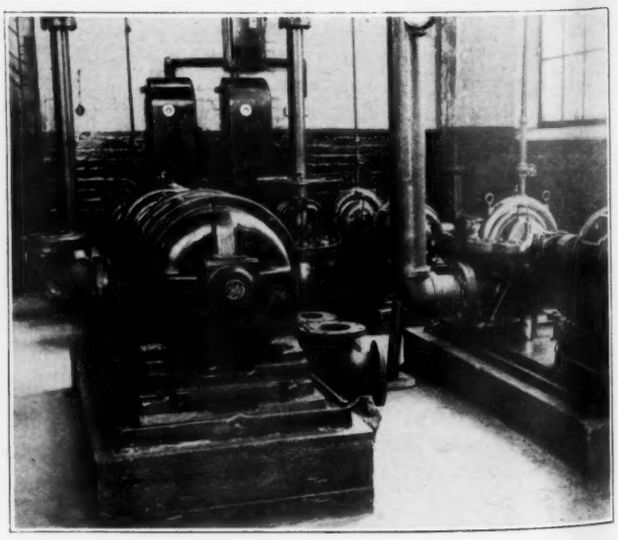
The conveyor discharges to an elevator and thence, by a screw-conveyor, to two feed-bins, which discharge to two Raymond 5-roller mills that grind the coal to a fineness of 92 per cent. passing 100-mesh. The mills are belt-driven by 75-hp. motors. A screw-conveyor takes the pulverized coal to a two-compartment kiln-feed bin on the burning floor and from there double-screw feeders pass it into



Generating equipment in the power house.

the air-stream leading to the kiln. The screw-feeders are separately driven through speed-reducers and Reeves variable-speed pulley drives. A Sturtevant No. 9 fan supplies the air for each kiln. A manifold connects the two air-lines so that in an emergency either fan can serve either kiln or both kilns. All kiln operations are controlled by the burner from a control board, which has kiln and coal-feeder revolution counters, rear-end temperature and draft gages, and the kiln-feeder, kiln, and filter-speed controls.

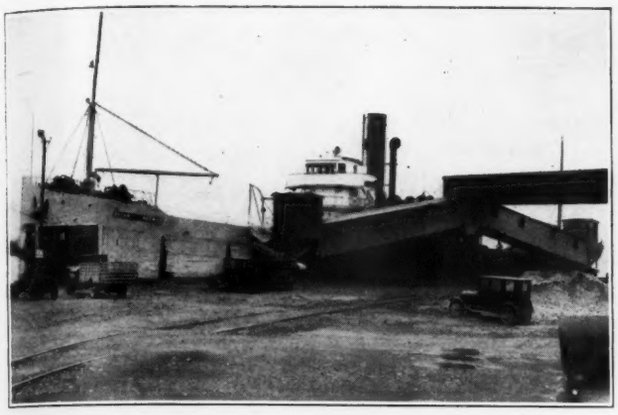
Gypsum.—The gypsum used at the plant comes



Centrifugal service pumps located at power plant.

from various sources. A graded size ranging from ¾-in. to 1½-in. is used.

Boats.—The company operates its own fleet of three boats for hauling stone, coal and cement. These are the "*Aetna,*" the "*O. J. Lingeman,*" and the "*Bunce.*" All are ocean-type freighters pur-



After discharging a load of coal the *O. J. Lingeman* takes on a cargo of cement.

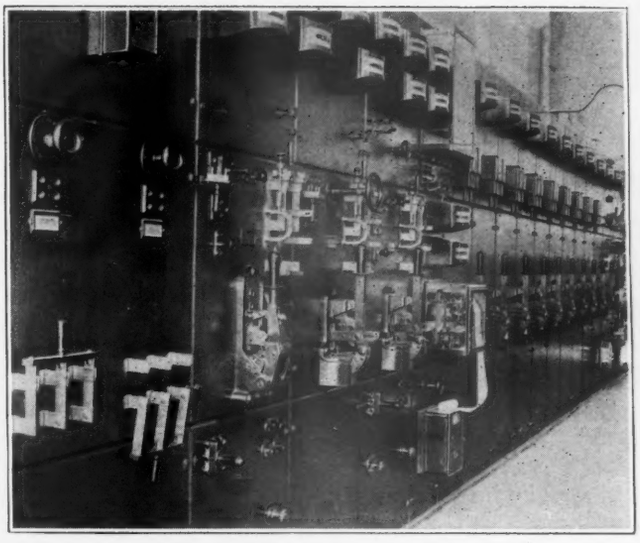
chased in 1926 and 1927. They are used for hauling stone from the quarry to the plant and for transporting cement from the plant to various warehouses. On return trips they also carry coal to the plant.

Power-House.—The waste heat from the kiln is utilized by two Edge Moor Iron Works 800-hp.

Waste-heat-boiler installation.

water-tube type waste-heat boilers, which receive the hot gas from the kiln flues at a temperature of 1,400 deg. F. An Edge Moor 400-hp. boiler in the same room alongside the kiln building is used as an auxiliary. This is also of the water-tube type and is equipped with a Taylor automatic stoker, a Foster super-heater, and a Greene fuel economizer. Each boiler has its individual draft fan, the two large ones being driven by 125-hp. motors and the small one by a 25-hp. motor. Steam is produced at 225-lb. pressure.

The steam generated by these boilers is utilized in the power-house, a two-story brick structure adjoining the boiler-room. A Cochrane V-notch re-



The 23-panel main switchboard in the power house.

cording meter, with a measuring capacity of 50,000 lb. of steam per hr., records the amount of steam produced by the boilers.

The main power unit is a G.E. 3,000-kw., 60-cycle, 3-phase, 2,300/4,000-v. alternating-current generator driven at 3,600 r.p.m. by a direct-connected Curtis steam turbine. A smaller G.E. auxiliary alternating-current generator is rated at 1,875 kv.-a, 1,500 kw., 60 cycles, and is driven at 3,600 r.p.m. by a direct-connected 3-stage Curtis steam turbine. Another alternating-current generator, also used as an auxiliary, is rated at 250 kv.-a., 200 kw., 60 cycles, and is driven at 3,600 r.p.m. by a Curtis 2-stage steam turbine. In addition to this equipment there are three separate direct-current generating sets. One produces 125-v., 100-kw. current and is driven by a 150-hp. motor. The other two produce 125-v., 35-kw. current and are driven by 50-hp. motors.

On the first floor of the building are the water-pumps and compressors serving the entire plant. Four Gould centrifugal pumps—two 4-in. units and two 2-in.—are used for general service. These are driven by 40-hp. and 20-hp. motors respectively.

(*Continued on page 37*)

E. A. Harris, chief clerk; O. A. Dibble, general superintendent; George Fay, foreman; J. Munsie, master mechanic; P. Bischoff, chief chemist; and G. Vosburgh, engineer.

Geology and Development of Minnesota's Nonmetallic-Mineral Resources*

By G. A. THIEL and G. M. SCHWARTZ

Department of Geology and Mineralogy
University of Minnesota

THE total value of mineral products of Minnesota in 1929, according to the report on Mineral Resources of the United States, was $136,349,610. The nonmetallic products are somewhat overshadowed by Minnesota's great production of iron ore which was 46,470,243 long tons in 1929, out of a total for the United States of 75,607,734 long tons. The corresponding figure for 1930 was 34,165,777 out of a total of 55,201,221 tons. The total value of the nonmetallic products for 1929 is $12,042,226. This figure is derived from the Bureau of Mines figures by subtracting these for the metallic ores.

The chief nonmetallic products are: building, monumental and ornamental stone; clay and clay products; crushed rock; sand and gravel. Lesser products are natural cement, Portland cement, lime, marl, flint lining and pebbles for tube-mills, sand-lime brick, and mineral water.

Of most of these products there is a great abundance and in many cases additional markets will result in greatly increased production.

Building, Monumental and Ornamental Stones.—The building and ornamental stones of Minnesota rank second in value of the mineral output, being exceeded only by iron ore. The production of monumental stone has been especially important at times and in recent years ornamental stones of very desirable types have been developed and have commanded a good market. Paving blocks are produced in considerable amounts. In 1929 Minnesota was credited with 56 operating plants that produced stone valued at $4,460,383.

A detailed description of the various commercial stones is given by Oliver Bowles in United States Geological Survey Bulletin 663, published in 1918.

Stone produced in Minnesota includes igneous, sedimentary, and metamorphic rock types. The distribution of the various formations is shown in a general way on Fig. 1, and the location of actual quarries is given on Fig. 2.

Igneous rocks include granite, gabbro, diorite, diabase and basalt. Sedimentary rocks are limestone, dolomite, and sandstone; also shale, which is discussed with clay. Metamorphic rocks are gneiss, quartzite, and slate.

Granite and granite gneiss comprise the most extensive and important rocks quarried in Minnesota and new quarries opened in recent years indicate that the possibilities have not been exhausted.

The St. Cloud area in the Mississippi River Valley is the main center of operations and the "St. Cloud red," "St. Cloud gray" and "Rockville" granites have been widely used, especially for monumental and ornamental purposes. Lately developments have shifted some of the production elsewhere, but the St. Cloud operators have made most of these developments.

The "St. Cloud gray" granite is medium to fine grained and fairly dark gray. The "St. Cloud red" is medium to coarse grained with red feldspar mottled with dark ferromagnesian minerals and gray quartz. The "Rockville" granite is a coarse porphyritic granite with a pinkish gray color. The feldspar varies from white to pink and ranges up to ¾ in. across, with the ferromagnesian constituents as much smaller grains. This furnishes a very attractive stone when polished and it has been widely used as an ornamental stone. It was used in the construction of the St. Paul Cathedral.

Next to the St. Cloud area in importance are the granite outcrops along Minnesota River from New Ulm upstream. Near Morton, Sacred Heart and Delhi are exposures of a dark granite gneiss which has recently attained considerable popularity because of the attractive effect secured by polishing.

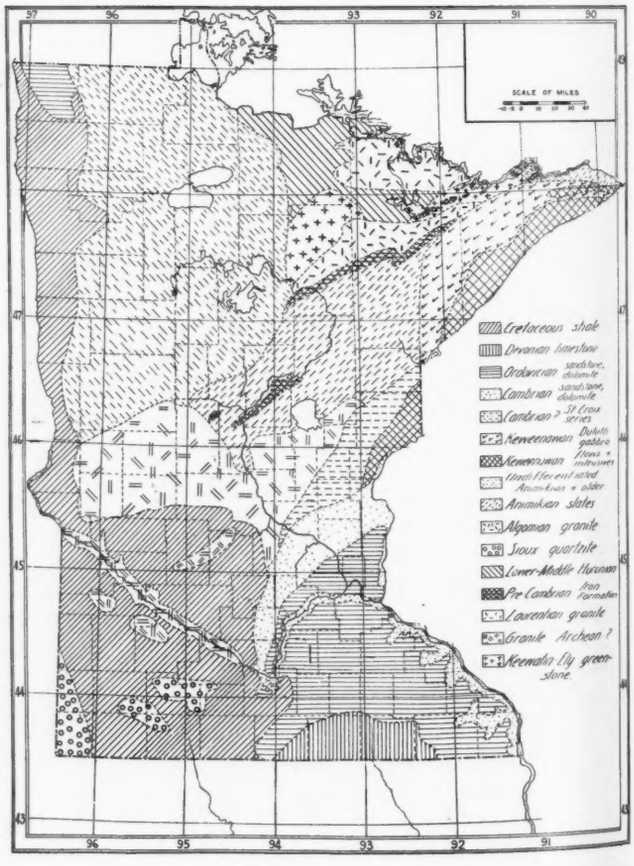


Fig. 1. Geologic map of Minnesota.

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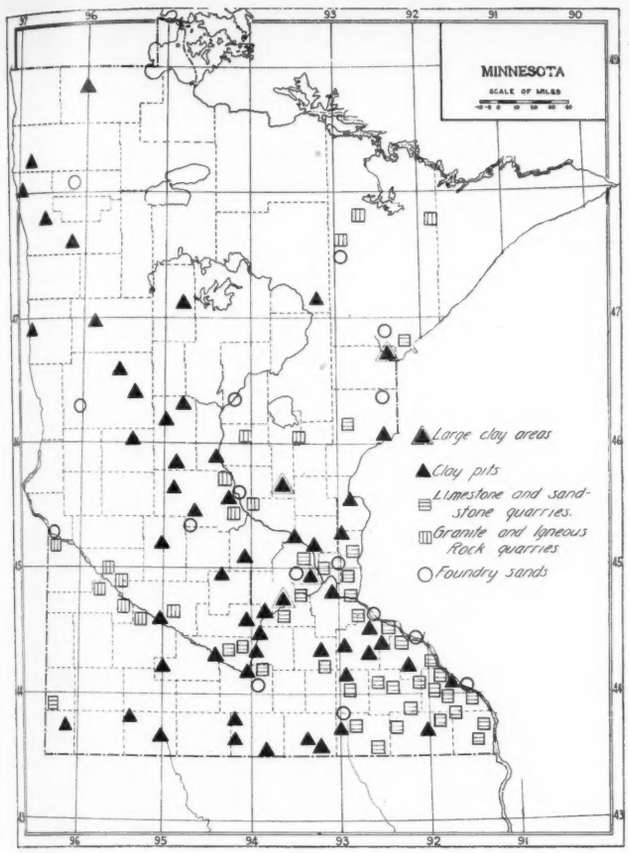


Fig. 2. Locations of clay, stone-quarry, and foundry-sand operations.

This is known commercially as "Oriental granite," also referred to sometimes as tapestry granite.

Various granites have been quarried at or near Ortonville, Montevideo and Granite Falls, and recently quarries have been opened at Seaforth some distance south of Minnesota River, where a light gray granite gneiss is utilized. A gray granite is quarried at a new quarry south of Hibbing and also at Wahkon and Hillman south of Mille Lacs.

Gabbros and diabases are very abundant in northeastern Minnesota, especially in St. Louis, Lake and Cook Counties. The Duluth gabbro, one of the largest masses of this type of rock in the world, extends from Duluth north and east in a great arc over 100 mi. long and varying up to 40 mi. in width. This rock has been utilized at Duluth mainly for crushing and the past year a quarry was developed south of Ely in an anorthositic phase of the gabbro designed to furnish a dark polished stone which is at present in high favor for architectural use. A quarry in another mass of gabbro has been developed at Cook, west of the Vermilion iron range.

Diorite has been quarried in Benton County but has not been actively produced in recent years. There are large outcrops of gabbro and diabase along the Minnesota shore of Lake Superior, some of which may prove of value if the demand for polished black stone continues.

Limestones and dolomites of the Paleozoic formations of the southeastern part of the state have been widely utilized from quarries scattered over the entire area as shown on Fig. 2. The most important areas are along the Minnesota River from Mankato to Kasota and near Red Wing on Mississippi River.

The most valuable type is the "Kasota" stone which is a phase of the Oneota dolomite and varies from deep yellow to pink. This rock is somewhat recrystallized, takes a good polish and has been widely used as a marble, for example, in the Minnesota State Capitol.

In Winona County the Oneota dolomite outcrops widely and has been developed at several quarries. Much of the stone is porous and has been widely used as "American travertine," both for external work and for decorative purposes.

Sandstone.—The Kettle River quarries at Sandstone have furnished a large amount of buff sandstone which has been shipped as far as Spokane, Wash. This rock is of Keweenawan or lower Cambrian age. In recent years it has been extensively used in concrete work.

A red or brown sandstone of probably the same age was formerly quarried at Fond du Lac on St. Louis River near Duluth.

The Cambrian sandstones of southeastern Minnesota are mostly too friable for building stone, although the Jordan has been used to some extent. As noted below, both the Jordan and St. Peter sandstones are useful for foundry sand, abrasive, filter sand, and so forth.

The principal commercial metamorphic rock in Minnesota is the Morton granite gneiss which is

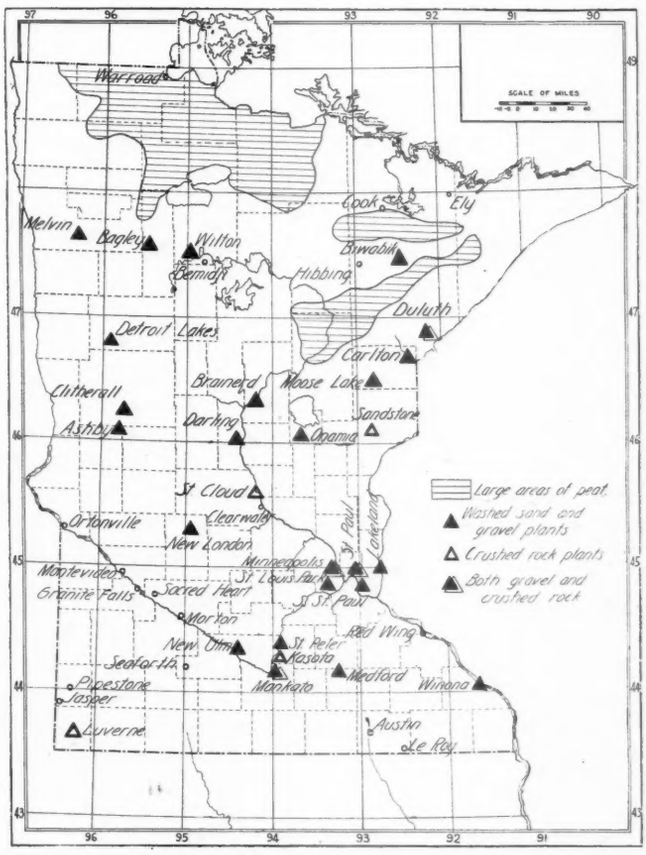


Fig. 3. Locations of sand, gravel, and crushed-stone plants. Peat areas also shown.

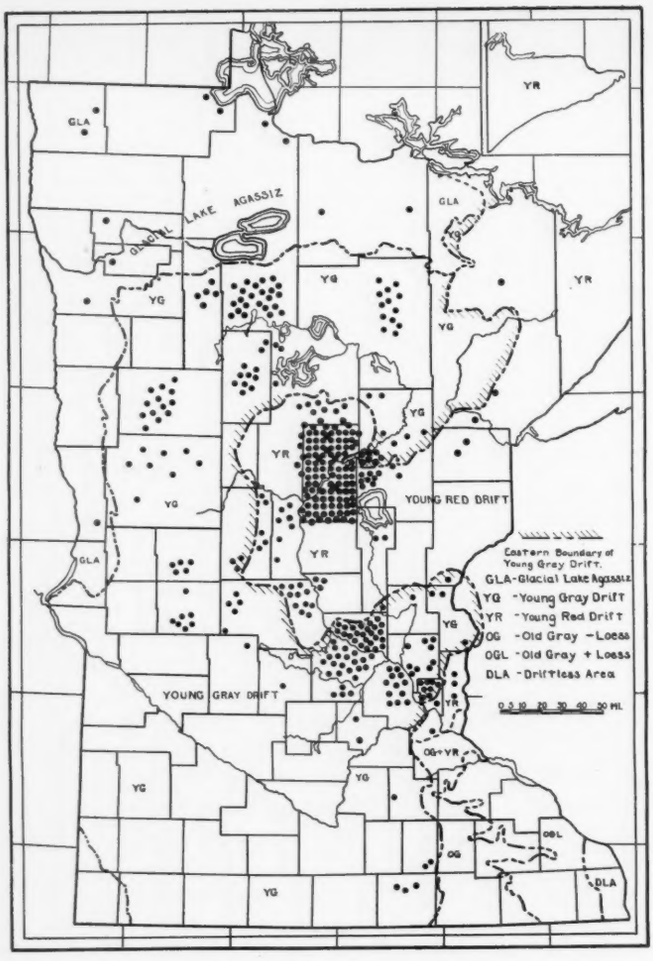


Fig. 4. Dots represent marl beds, and their relation to various types of glacial drift are indicated.

apparently a mixture of dark metamorphic rock injected by granite. It has been described with the granite. Other metamorphic rocks which have been utilized are the Sioux quartzite of southwestern Minnesota and the Carlton slate. The quartzite has been used to a considerable extent for building blocks, paving blocks, crushed rock and ball-mill liners and grinding pebbles. Quarries have been opened in Nicollet, Pipestone, Cottonwood, Rock and Watonwan Counties. Quartzite has been quarried also north of the Mesabi iron range in St. Louis County.

Attempts have been made to quarry roofing slate in Carlton County, but the material is rather brittle. Other slates are widespread in northern Minnesota, but do not appear to be of commercial value.

Crushed Rock Aggregate.—Gabbro and diabase rocks are quarried and crushed for construction work in Lake and St. Louis Counties. A plant at Two Harbors excavates diabase and the Duluth Crushed Stone Co. operates a quarry in the Duluth gabbro. The rock is a typical anorthosite, consisting almost entirely of plagioclase. It is dark brown to black in color and is cut by numerous irregular jointing and sheeting planes which cause it to break quite readily. The quarry is of the shelf type and rock handling is comparatively easy. In general the output is about evenly divided between crushed rock and riprap, with subordinate amounts of rubble for foundations and for retaining walls.

Granite rocks are quarried and crushed at St. Cloud. Both the gray and the red granites of this vicinity have furnished crushed rock for roads and concrete. Rubble is supplied for rough masonry and much waste rock was supplied in past years for railroad ballast and filling.

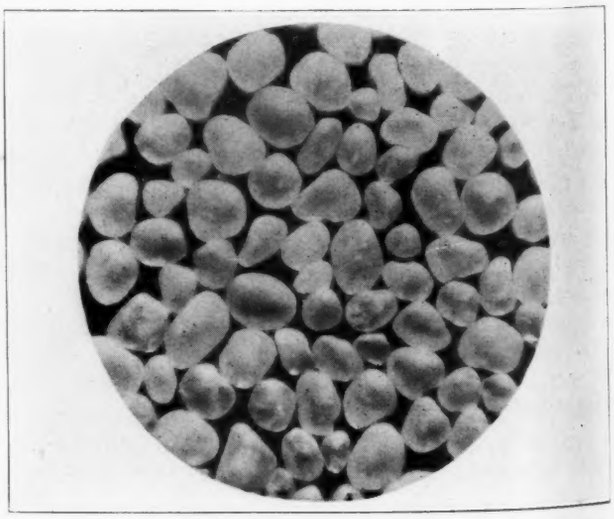
The Sioux quartzite is furnishing small amounts of crushed stone as a by-product of the quarry operations in Pipestone County. A red quartzite near New Ulm in the north bank of the valley of Minnesota River has been extensively quarried and crushed. On the Mesabi range the Pokegama quartzite is being crushed at a small plant near Hibbing.

Limestones and dolomites are crushed for various purposes at plants located at Kasota, Mankato, Minneapolis and St. Paul. At the Kasota plant the crushed rock is a by-product of the building-stone industry. The Twin City plants quarry and crush the rock for concrete and other uses and the fine tailings are marketed for agricultural purposes.

Sandstone waste from the quarries in the bluffs of Kettle River near Sandstone is crushed for paving and other uses.

Crushed Roofing Material.—Crushed rock for use in the manufacture of artificial shingles at Minneapolis is produced by a plant near Ely in Lake County, which utilizes a slaty or schistose phase of the Ely greenstone. The Ely greenstone consists of a series of much metamorphosed Archean basalt flows which crops out extensively in the Vermilion iron district but does not furnish commercial material except at the plant near Ely. This material is the desired green color for shingles and does not fade or decompose on exposure.

Sand and Gravel.—Due to an expansion of the program for highway construction within the state, a number of new sand-and-gravel plants have been established to meet the increasing demand for these materials (Fig. 3). The geologic formations which produce sand and gravel may be grouped as follows: (1) bed rock, (2) glacial deposits, and (3) recent sediments.



Photomicrograph of St. Peter sandstone from Mendota, Minn., showing roundness and frosty appearance of the quartz grains.

Gravels derived from bed-rock formations are not used to a great extent for structural purposes. The glacial deposits that can be utilized more satisfactorily are found (1) in areas of outwash sand and gravel, (2) in regions of sandy moraine, (3) in kames and kame-like ridges, and (4) in sandy eskers or "serpent-ridges." Deposits of these types are most abundant in a zone from the west central to the southeastern part of the state. Large areas in the southwestern and south central part of the state are covered with clayey till deposited by the late Wisconsin ice sheet. The post-glacial sediments supplying sand and gravel are found along the valleys of Minnesota and Mississippi Rivers. Both streams have extensive terraces of alluvial gravels. The southeastern counties of the state have no other gravel deposits. A large washing and screening plant at Winona furnishes most of the building and paving gravel for that region.

The sand-and-gravel plants in and near St. Paul and Minneapolis utilize sandy glacial moraine. In Red River Valley several plants excavate the beach sands and gravel from the abandoned beaches of glacial Lake Agassiz. The plant at Moose Lake is within the area once covered by glacial Lake Duluth and the sands and gravels of that region were washed and sorted by wave action. Much of the gravel at New Ulm is taken from the alluvial terraces of the glacial river, Warren, that once drained Lake Agassiz into the Gulf of Mexico.

The accompanying table gives the production and value of sand and gravel utilized in 1928. The unclassified total for the year 1929 is given by the United States Geological Survey as 4,990,256 tons, valued at $2,412,776:

Sand and Gravel Production in Minnesota, 1928
(United States Geological Survey, Mineral Resources)

Material	*Short Tons*	*Value*
Building sand	741,391	$ 232,971
Paving sand	537,717	201,248
Engine sand	50,760	17,257
Building gravel	712,897	454,761
Paving gravel	946,692	700,166
Railroad-ballast gravel	1,254,752	362,985
Total	4,244,509	$1,969,388

Quartzite Abrasive.—The Sioux quartzite which outcrops extensively in southwestern Minnesota, as noted above under building stone, is also used as "pebbles" and liners in ball-mills where it is very serviceable because of its extreme hardness, density, and toughness. Considerable material for this purpose is quarried at Jasper and shipped to metallurgical plants in the West. This material is also suitable for paving blocks and other purposes where a very hard, tough material is desired. Minnesota ranks first among the states in production of both liners and pebbles for grinding mills.

Sand Abrasive.—Underground operations in the Jordan sandstone at Eggleston near Red Wing on Mississippi River have supplied stone plants of the Twin Cities with sand needed for sawing operations. The St. Peter sandstone which outcrops within the cities is used for rough finishing. The Jordan sandstone is also used for filter beds at both the Minneapolis and St. Paul water plants.

The Ford plant on Mississippi River has mined the St. Peter sandstone extensively on its property for use in polishing plate glass. The Jordan furnished some sand suitable for glass making, but the St. Peter is usually slightly high in iron.

Foundry Sands.—The foundry sands of Minnesota have been investigated in some detail by G. N. Knapp and are described in Bulletin 18 of the Minnesota Geological Survey, to which one should refer for details regarding tests, locations of deposits, and so forth. Previous to the entrance of the United States into the World War most of the molding sand used in Minnesota was shipped in from the East. Difficulty in shipping made local sources of supply essential and investigation shows that an abundance of sand, in some cases of superior quality, is available near the foundries. Minnesota contains an abundance of foundry sands and all

A glaciated outcrop of massive red granite near Montevideo.

material commonly used for making molds in foundries of iron, steel, bronze and aluminum, except possibly a highly plastic refractory clay.

The following formations yield material which is being used or which could be used for molding sand: Sioux quartzite, Kettle River sandstone, Jordan sandstone, St. Peter sandstone, Cretaceous shales, glacial deposits and loess.

The Kettle River sandstone has furnished screenings from the quarries at Sandstone for foundries in Duluth, St. Paul and Minneapolis.

The Jordan sandstone, which is the uppermost formation of Cambrian age, crops out along Minnesota River and along Mississippi River below Red Wing. The sandstone is remarkably uniform and furnishes nearly pure silica.

The St. Peter formation of Ordovician age consists of about 200 ft. of nearly pure quartz sand. For ordinary core work the St. Peter sand is very satisfactory and, since it constitutes the bed rock most exposed in Minneapolis and St. Paul, it is widely used.

The Cretaceous clays formerly covered much of Minnesota and now remain as outliers at various points in the eastern part of the state. Much clay in these deposits is not only satisfactory for the usual ceramic uses but is useful as foundry clay.

Almost the entire area of Minnesota is covered with glacial deposits of various ice sheets consisting of a wide variety of materials. Some of these are used locally.

The loess deposits which are widespread in northeastern Minnesota furnish molding sands for brass and other alloys (Fig. 4).

Natural Cement.—Natural cement is produced at Mankato and Austin. At Mankato hydraulic cement is manufactured from material quarried on Blue Earth River where the Shakopee dolomite is utilized. Operations began in 1882 and have continued to the present.

At Austin Devonian limestone has been quarried and used for hydraulic cement as well as for lime. This plant has been in operation nearly as long as the one at Mankato and both have been decidedly successful.

Portland Cement.—Portland cement has not been an important product in Minnesota mainly because most of the limestones are high in magnesia. Recent work by the Minnesota Geological Survey has shown, however, that suitable limestones do exist, but the great plant capacity already developed in the United States has retarded the use of these deposits. The only Portland cement plant in Minnesota is located at Duluth, where slag from the blast-furnaces of the United States Steel Corp. is utilized. The limestone for smelting operations and for the cement plant is brought in by boat, there being no limestone deposits near Duluth.

The high-grade limestones suitable for the manufacture of Portland cement and high-grade lime will be described in a forthcoming bulletin of the Minnesota Geological Survey.

Marl.—Marl is a soft, earthy, white mineral substance composed largely of calcium carbonate that is found as a freshwater deposit in lake basins or bogs and marshes that were once covered with water. The source of the lime deposited as marl in this state is the glacial drift with its heterogeneous mass of clay, sand, gravel and bowlders. In nearly every actively growing marl lake a series of stages of development may be noted: first, a near-shore marl bed deposited to nearly water level and covered by a thin layer of marshy and peaty vegetation; second, the fringing zone of shallow water where precipitation and deposition of lime is most active; and, third, the inner and deeper zone where precipitation is slower and the marl bed thinner, and not as high grade.

Devonian (Cedar Valley) limestone in a quarry near LeRoy.

The three largest deposits of marl in Minnesota are found in widely separated areas. One is located at Star Lake in Crow Wing County and extends along the streams to adjoining lake basins. The marl bed is locally over 20 ft. thick and assays as high as 95 per cent. calcium carbonate. It contains several millions of tons of marl. Another large deposit is located near Clearwater in Stearns County. Here the lake level has been lowered over 10 ft., exposing large areas of high-grade marl in abandoned bays and along the shore line. A third large deposit occurs in a bog near Bemidji.

Marl has been extensively used by highway engineers as a binder for sandy soils in Crow Wing, Morrison and Anoka Counties. It is mixed with the sand by plowing and harrowing it into the road beds. At Clearwater marl is excavated with slips, loaded into trucks and hauled to the railroad, where it is dumped on flat cars for transportation to the acid soil areas of the Mississippi valley. Dozens of small deposits throughout the state are being excavated and the lime used as a soil sweetener.

Investigations by Dr. R. E. Kirk have shown that many of the marl beds are chemically suited for the manufacture of cement.

Lime.—Lime has been produced at various places in the area of Paleozoic rocks of the southeastern part of the state, but recently only two plants have been in operation. These are at LeRoy and Mankato. Natural cement is also produced at Austin. There are extensive deposits of high-grade limestone in the southeastern part of the state suitable for producing high-calcium lime, but a limited demand has discouraged development.

Feldspar.—Deposits of plagioclase feldspar or anorthosite, some of remarkable purity, are very abundant along the north shore of Lake Superior in Lake and Cook Counties. At an early date quarries were opened at Split Rock and Crystal Bay, apparently with the mistaken idea that the material was corundum. These ventures were unsuccessful and the quarries closed. Experiments designed to find uses for this material have been carried out, but thus far they have not been successful.

Recently deposits of high-grade feldspar have been opened on the small part of Minnesota in the Lake of the Woods, known as the Northwest Angle. The mine is on a pegmatite in a ridge consisting mostly of Keewatin greenstone. The belt of pegmatites is over ¼ mi. long and about 200 yd. wide and consists of overlapping lenses.

The feldspar is slightly pinkish and consists of an intergrowth of potash and soda feldspars. The material is of high grade and a mill has been built at Warroad to grind the material for marketing.

Graphite.—Graphite schists with a high percentage of graphite occur in the Huronian slates in Carlton County to the southwest of Duluth and also in the Keewatin schists in the Vermilion range areas near Tower. A number of test pits have been dug in central Carlton County, but none have been worked on a commercial scale.

What Are the Determining Factors Which Constitute Concrete Control?

By T. C. POWERS
Associate Engineer, Research Laboratory, Portland Cement Assn.

ONE of the most promising possibilities for economy and improved quality in concrete construction lies in the development of field methods which will insure the production and placement of consistently uniform concrete of predetermined quality. It is, perhaps, the recognition of this possibility that has led to the increasing investment in improved and more expensive proportioning equipment, and to the use of field laboratories where more or less elaborate routine procedures are carried on. It must be said that the results from these attempts at improvement are not always gratifying, do not always seem to justify the money and effort expended.

Such disappointments are often the result of leaving certain important factors still uncontrolled, due perhaps to a misconception of the essentials of control. Too often it is assumed that control begins and ends with the selection and installation of certain measuring devices. Such was the case, for example, at a certain plant where a considerable amount was spent for weighing equipment to proportion aggregates, the grading of which was variable. Although the proportions did not vary, they were often the precisely wrong proportions for the existing aggregate gradation. This naturally resulted in a product of widely fluctuating quality.

A similar condition evidently prevailed on a large project recently completed, one of the first to use weighing equipment on large-scale construction. The published reports of this work were surprising in that they showed that the uniformity of the product was no better than that secured on other projects where obviously inferior equipment had been used. Evidently some important variable had been neglected or overlooked.

When results of this kind are obtained the wisdom of such an investment, as far as quality control is concerned, may well be questioned. It is realized, however, that under some conditions, considerations other than quality alone determine the choice of equipment. For example, commercial central-mixing plants require the flexibility of weighing equipment whether improved quality is obtained or not. But when the investment is made for whatever reason, it is to be regretted if the full value of that investment is not realized.

In view of these familiar conditions and the not always successful efforts to change them, it is felt that a consideration of a few phases of the essential requirements of control might be helpful. In reviewing this problem there will be in mind a standard of quality higher than that usually regarded as satisfactory, a standard made attainable by the advent of better equipment.

Specifications.—In the first place, to comply strictly with a specification does not necessarily guarantee control of quality. Often the real intent of the specifications—concrete of definite and reasonably uniform quality—can be realized only by ignoring their fallacies and omissions. Many specifications, for example, prescribe proportions, such as 1-2-4, and at the same time are so broad in the aggregate specification as to tolerate positively unworkable gradations when used in the specified proportions. Under such conditions, control of quality can be had only by going beyond the specification, for the underlying laws governing concrete quality are always the same; the mere terminology of the specification can not change the essential requirements of quality control.

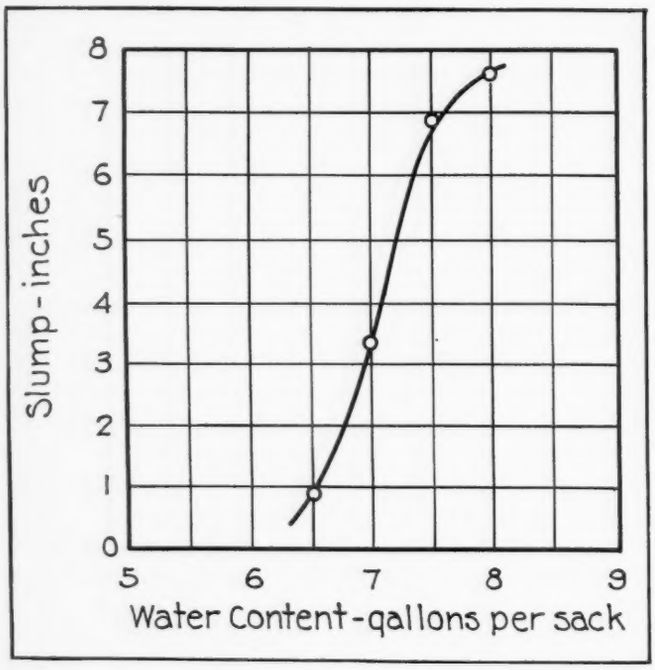
The Two-Fold Purpose of Control.—The objective of control must, of course, be clearly in mind before the means of attaining that objective can be considered. It has become almost trite to state that the potential qualities of any concrete mixture are fixed chiefly by the characteristics of the cementing paste. The characteristics of the paste depend, so far as anything that can be done at the mixing plant is concerned, largely upon the proportion of the cement to water—the water-cement ratio. But the man in the field knows, perhaps better than most laboratory men, that this is only half of it. He knows that the control of the water-cement ratio alone will not produce uniform concrete under many conditions commonly encountered. The mixture must always be of such character as to make it possible to be properly placed with reasonable ease by means of the tools provided. In other words, uniformity of the quality of the concrete in place depends fully as much on maintaining uniform workability suitable to the existing conditions as it does upon maintaining the proper water-cement ratio. Thus, the purpose of control may be said to be two-fold: to maintain (1) the desired water-ratio and (2) uniform workability.

Control When a Fixed Quantity of Cement is Used With Each Batch.—There is such a wide variety of situations to be found in the field that a general consideration can not hope to be applicable in every detail to all conditions. However, to consider one or two typical conditions should be sufficient to establish the fundamental principles involved.

One of the situations most commonly encountered is that in which conditions of the job, or the specification under which the concrete is being produced, make it necessary to use a fixed quantity of cement with each batch of concrete of a given class. The belief is often expressed that if the full quantity of cement is always used, quality is assured. Others feel that the maximum amount of water must be rigidly fixed also. In the light of the two-fold nature of control, as given above, it can not be said that to comply with either of these requirements will necessarily assure the desired re-

sults. It will be shown that the gradation and quantity of aggregate must receive most careful attention in order to secure that uniformity of quality whch may be reasonably expected from the use of improved equipment.

A fixed cement content does not insure concrete of uniform quality, because workability and strength may vary widely without violating the cement requirement. Strength may vary for the now obvious reason that cement alone is not the cementing agent. Water is just as essential as the cement, for it is the paste made of cement and



Typical relation between water requirement and consistency as measured by the slump cone.

water that really forms the binding medium. Since the quality of this paste is largely dependent on the proportion of cement to water it is obvious that when the quantity of cement in a batch is fixed, strength control lies in the control of the quantity of mixing water.

But this water control is not as simple as is sometimes assumed; for effective control of water content requires more than the mere control of consistency or the setting of an upper limit to the added mixing water. It is easy to say arbitrarily that the quantity of water must be kept below a certain amount, assuming that any variations must be in the direction of higher quality. But, practically, rigid water control alone has not always produced good concrete, the variations in quality not always being in the direction assumed. It should be remembered that once a batch of cement and aggregate is in the mixer, there is just one quantity of water that will give the correct consistency for that particular combination of materials and placing conditions. If the aggregate in the next batch differs from the first in moisture content, gradation, or quantity, the water requirement of that batch will be correspondingly different. If, then, the quantity of water added is arbitrarily fixed, there will result wide fluctuations in workability, so that in the end at least one of the purposes of control is defeated.

Sometimes the fluctuation in moisture content is determined by frequent tests, and the quantity of water to be added adjusted accordingly; but very often it is found to be impossible to anticipate the necessary changes, the adjustments always lagging behind. Moreover, even when the moisture in the materials is properly accounted for there still remains possible variation in water requirement due to changes in the gradation of the aggregate. The net result is a continuous variation in workability.

For these reasons it is believed that the amount of water to be added should finally be determined at the mixer, for the exact quantity—down to the last quart that makes the consistency right or wrong—can not be predetermined with sufficient accuracy. Knowledge of the actual water requirement thus obtained by trial may then be used to determine whether the mixture is correct. If the maximum water requirement exceeds that desired, it simply means that the mixture must be enriched, or possibly the aggregate gradation may need adjustment.

As shown by the accompanying chart, in the range of consistencies represented by slumps of from 2 to 5 in. small variation in the water content sufficient to cause extreme variation in workability may have but an unimportant effect on strength. Suppose, for example, that concrete is being placed in reinforced beams and columns, where a consistency not drier than about a 5-in. slump is required, but the consistency for some reason has changed to about a 2-in. slump. If the water limit is rigidly maintained, the batch must go through dry and perhaps show up later as a bad honeycomb in a column. But, as the accompanying figure illustrates, the addition of not over ½ gal. of water per sack would restore the proper consistency.

If the change in consistency happened to be due to a moisture change in the aggregate the strength would not be lowered by adding the ½ gal. of water.

If, on the other hand, a change in gradation were responsible, a loss of strength of not over 10 or 15 per cent. would obtain until such time as the mix could be adjusted. Under such conditions it seems obvious that to risk temporarily a maximum strength loss of 10 or 15 per cent. is better practice than to allow an increase in placing difficulties.

Thus, it is believed that the first step toward control is to maintain as uniform consistency as possible by making, whenever necessary, water adjustments at the mixer. The second step is to control the quantity and gradation of aggregate so that the water requirement of each batch does not exceed, nor vary widely from, the desired quantity. This second step is particularly important for at least two reasons. First, it is necessary to the control of workability, for to maintain constant consistency alone does not necessarily insure uniform workability; that depends upon the proper balance between the gradation of the aggregates and the quantity of cement, as well as on consistency. And

then, when gradation is constant, control of consistency is a very practical means of controlling quality.[1]

Control When Cement Quantity Can Be Varied.—The more modern practice in writing specifications is to make the proportion of cement to water the principal factor specified, leaving leeway as to the quantity of cement. Under such a specification, small jobs are satisfactorily controlled without special equipment by adjusting the cement and water according to the requirements of the aggregate; or, what is virtually the same thing, by changing the quantity of aggregates whenever the mixture becomes unmanageable. However, the results satisfactory for the small job using a small outlay of equipment do not meet the standard which may be reasonably set for larger and more elaborate setups. On the small job variation in strength or workability may be tolerated only because of the small outlay, and then only when the variations are compensated by a generous margin of extra quality. A more expensive outlay should allow a reduction in this safety margin by raising the minimum quality to a considerably higher level.

When bulk cement and weighing equipment are used, the control of the water and cement quantities is greatly simplified. Or, if it seems advisable to keep the cement quantity constant, changes in the quantity of the aggregates are most easily accomplished by means of such equipment. However, in the writer's opinion, an investment in equipment of this sort is not justified if it is used merely to control the proportion of cement to water; because it is frequently next to impossible to maintain both constant water-cement ratio and uniform workability solely by means of juggling the proportions to accommodate variable moisture and gradation. Such an expenditure is justified for the sake of quality control, only when the gradation of the aggregate is also under control.

Thus, under a water-cement-ratio specification, just as under any other, it is necessary to control the quantity and gradation of aggregates in such a way that frequent changes in proportions are unnecessary. Just what degree of control is desirable depends, of course, upon local conditions. It may often be cheaper to allow an ample margin of extra quality as compensation for inevitable variation than to provide the means of preventing these variations. This is probably the case on most small jobs. On the other hand, there are many conditions where careful attention to the detail of control and the use of precision proportioning equipment allows gratifying economy in material and gives a uniform product not obtainable by any other means. Once precisely-controlled concrete has been used, the old more or less haphazard methods seem woefully inadequate.

Aggregate Control.—If, then, the control of aggregate gradation is of such paramount importance, it may be well to inquire a little further as to what constitutes its control. As stated above, control of the aggregate involves control of grading and quantity. (This presupposes, of course, that the mineralogical quality of the aggregate is suitable and constant.) It was stated also that to maintain exact proportions is useless if the grading varies frequently or irregularly, because the proportions correct for one gradation are likely to be quite incorrect for another, and it has not been found practicable to follow variations in gradation by compensating changes in proportions, except where the changes occur infrequently. This means that the control of grading must be accomplished before the material leaves the proportioning hopper, for segregation may occur anywhere along the line from the producing plant to the mixer.

Control of Coarse Aggregate.—When fluctuating gradation of the coarse aggregate is to be expected frequently, as it usually is, it has been found that the only feasible method of control is to separate the aggregates into as many divisions as are necessary to nullify the effect of segregation. There is a tendency among some concrete producers to circumvent segregation by using only one coarse aggregate of narrow size range. The use of such single-size aggregates obviates the necessity of multiple bins or stock-piles and good concrete can be made with it, provided the mixtures are properly proportioned. Whether the convenience and economy of one bin or stock-pile, as compared with two or three, will justify the wasting of intermediate sizes must be decided, of course, according to local conditions. Where the usual range of sizes is employed, separation of coarse aggregate graded up to 1½ in. into two sizes is usually satisfactory. When the maximum size is 2½ or 3 in., three divisions are to be preferred.

Several instances have been found where a plant has not been operated so as to take advantage of the opportunities for grading control afforded by its good design and proportioning equipment. For example, a certain plant was required to supply two classes of concrete, one with coarse aggregate graded to 2½ in., and the other to 1 in. Three bins were provided, one for the ¼-to-2½-in., one for ¼-to-1-in. material, and the other for sand. Thus, when supplying the concrete using the 2½-in. maximum, half the total coarse-aggregate storage capacity lay idle. Furthermore, the possibility of segregation in the material covering the wider range of sizes was very great. Had one of the bins been used for 1-to-2½-in. instead of ¼-to-2½-in., drawing appropriate amounts from both coarse-aggregate bins when supplying the 2½-in. maximum material, segregation difficulties would have been minimized and more of the storage capacity utilized.

Control of Fine Aggregate.—Sometimes the control of coarse-aggregate gradation alone does not produce good results, for the grading of the sand has a marked effect on the strength, permeability and, especially, workability, even when the quality of the cementing paste remains constant. When the grading of the sand varies through a comparatively wide range, or when it is deficient in fines, experience has shown that uniform concrete can be

[1] Constant Consistency as an Aid to Concrete Control. *Eng. News-Rec.*, v. 107, No. 10, p. 368, Sept. 3, 1931.

had only by using two sizes of sand, fine and coarse, blending them in such proportions as necessary to produce a nearly constant material. This is not done by dividing the sand with a screen, as with coarse aggregate, because of the mechanical difficulties of such screening, and because the necessary sizes may not be available from one source. The usual practice is to carry a supply of two kinds of sand, one of a coarse gradation suitable for the richer mixes and the other comparable to a masons' sand, or finer. The fine sand is proportioned separately, the quantity being governed by its fineness and the richness of the mixture. By such use of two suitable sands it has been found possible to produce concrete of uniform workability at any desired richness or water-cement ratio.

Control of Placing.—The foregoing discussion has dealt largely with the conditions necessary to impart certain potential qualities to concrete. However, these qualities can not be realized unless the concrete is properly handled after it leaves the mixer. Much time and energy have been expended in studying the various factors which go to make a correct mixture for a given quality. Much less consideration has been given to methods by which the material may be placed so as fully to realize its potential qualities. It is outside the purpose of this discussion to consider the possibilities of new mechanical methods of placing. Rather I shall consider briefly only some of the conditions now met on jobs every day.

It is difficult to say very much of a general nature about this important step in the process, except that proper and adequate placing methods are always the result of applying common sense and shrewd forethought. Forethought is often found lacking. For example, arrangements on a certain job were such that fully three-fourths of the effort of placing was expended in forcing concrete through a maze of vertical reinforcing bars. Forethought would have shown the advisability of providing means of depositing concrete on both sides of the steel with a saving of time, money and, more important, with distinctly-improved results.

The source of trouble is sometimes the equipment itself, such as a chuting system which reaches only a part of the area to be covered. The remaining inaccessible portion is usually filled by sluicing the concrete into place, or by excessive shoveling and puddling, giving rise to segregation, *laitance* and a poor product in general.

However, ingenuity and forethought on this end of the job will be fruitless unless the control of the mixing end of the operation is such as to aid placing. As discussed above, it should be considered absolutely essential to maintain consistency and workability suitable for the existing conditions of placing and placing equipment. No amount of ingenuity can properly place a mixture which has been flooded with water or in which the gradation is such as to make the mixture harsh and segregating. Uniformity is important, for it is often the occasional batch—too dry, over wet, or harsh—that causes serious difficulty.

Making Figures Agree with Facts.—One of the most important and perhaps least appreciated difficulties to be overcome in producing quality concrete is the proper translation of laboratory values to conditions of the field, and the accurate description of field results in terms of test records. Reams have been filled with figures which were intended to be a record of the concrete quality as produced. Yet in some cases the results do not agree with the picture presented by the records.

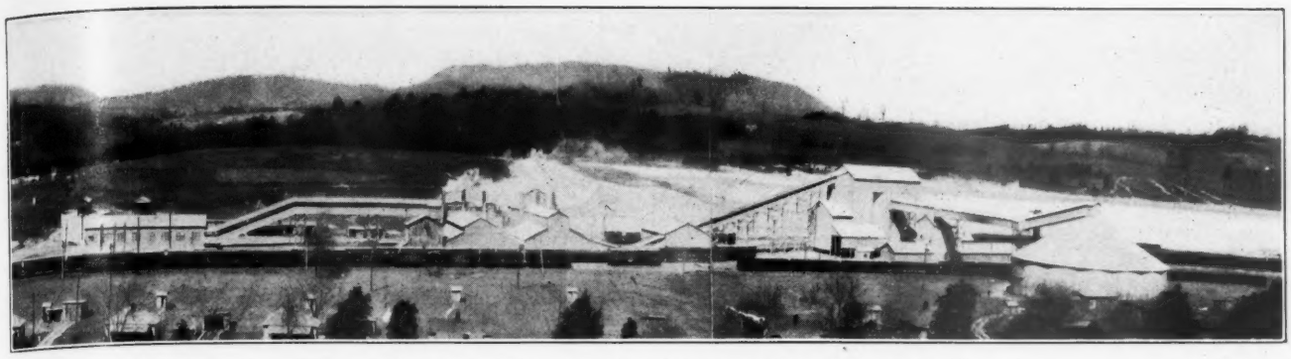
As an example of the difficulty sometimes caused by inaccurate translation of laboratory values to the field, there is in mind a job that went through all the motions of producing concrete controlled according to modern methods. After several weeks of careful preliminary study in the laboratory the best proportions for the materials at hand were determined. When the job started, the proportioning equipment was adjusted to conform with this carefully-designed mixture. But the results did not at all agree with those to be expected from the laboratory tests. It was more than a year before it was discovered that the technician did not have accurate knowledge of the size of the proportioning devices and that each batch contained about 30 per cent. more sand than the figures showed.

The example cited just above is rather extreme, but it is an indication and a warning of the many less obvious errors which can be made. In justice to this technician it should be said that his error was a natural one and not due to unusual carelessness. A peculiar circumstance made such an error possible. However, it emphasizes the fact that making field concrete an accurate reproduction of carefully-designed mixes requires careful thought and attention to details. Knowing this, the experienced technician will not, because his figures show that the mix must be good, be blind to visually-poor concrete. Instead, he will at once search for the discrepancy between the facts and his figures.

Conclusion.—Some salient features of control have been discussed in attempting to call attention to their relative importance, especially in regard to the problem of realizing the full value from improved proportioning equipment. The underlying laws affecting strength and workability, regardless of the wording of the specifications, determine the factors which must be controlled to produce uniform concrete. While a fair degree of uniformity of strength can be obtained by controlling the quantity of cement and water alone, precise control of both strength and workability, such as may reasonably be expected from the improved equipment, is obtained only when the gradation and the quantities of the aggregates, fine and coarse, are closely controlled also.

Placing is an extremely important step in the production of quality concrete. Its control consists chiefly of providing suitable equipment and suitable mixtures and in anticipating difficulties peculiar to the job.

Difficulties on the job are sometimes caused by inaccurate translation of laboratory-designed mixes to conditions of the field. Errors are easily made and apparent discrepancies between facts and figures should be promptly checked.



Panorama of operations, American Limestone Co., Mascct, Tenn.

Tennessee Firm Specializes in Preparing Pulverized Limestone Products

Zinc Company's Flotation Mill Provides Raw Material for American Limestone Co.

PRODUCING limestone materials in what is probably the largest-scale operation of its kind is but one of the activities of the American Limestone Co. Its plant at Mascot, Tenn., is in reality a by-product operation developed in connection with huge zinc mining and milling plants of the American Zinc Co.

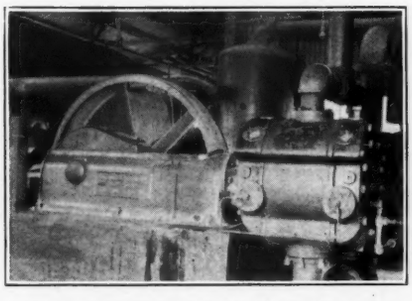
The company specializes in the manufacture of dried pulverized limestone products which are sold under the trade name "Mascot." These include aglime, asphalt filler and "Ferto," the latter a special mixed aglime. All dried products are shipped in either paper or burlap sacks, or in bulk. Some idea of the size of the operation can be gained from the fact that the company's production capacity for dried products is 5,000 tons per week. The shipping capacity, because of large storage facilities, is much higher, however. Other products include air-dried aglime, wet and dried sand, chatts in several grades, railroad ballast and stone sand. B. F. Gibson is superintendent of the American Limestone Co. operations at Mascot.

As the source of the pulverized limestone is the flotation mill of the American Zinc Co., a brief summary of the flow of materials through this mining operation will be in order. To begin, the Mascot mining operation consists of two mines with four shafts. Operations in the ore deposit are conducted at levels approximately 700 ft. below the ground, and, incidentally, the methods of recovering are rated as being among the best in the country. The zinc-sulphide ore contains, associated with it, dolomite, calcite, pyrite, quartz and other similar materials.

Following its recovery from the mines, the ore is sent through primary and secondary crushing processes and thence, by an 1,800-ft. tramway, to the mill, where it receives a further crushing, followed by classification in revolving screens, the screens being in closed-circuit with the crusher. The ore is then ready for treatment in the jigging department. This process separates the ore "middlings" from the chatts, the latter being sent to the American Limestone Co. for preparation and shipment as ballast and as aggregate materials. This phase of the work will be taken up in more detail later. "Tailings" from the cleaner and sand jigs are sent to the fine-grinding department, where they are ground in wet-process rod- and ball-mills operated in closed-circuit with a Dorr classifier. The overflow of the classifier is pumped to the flotation mill.

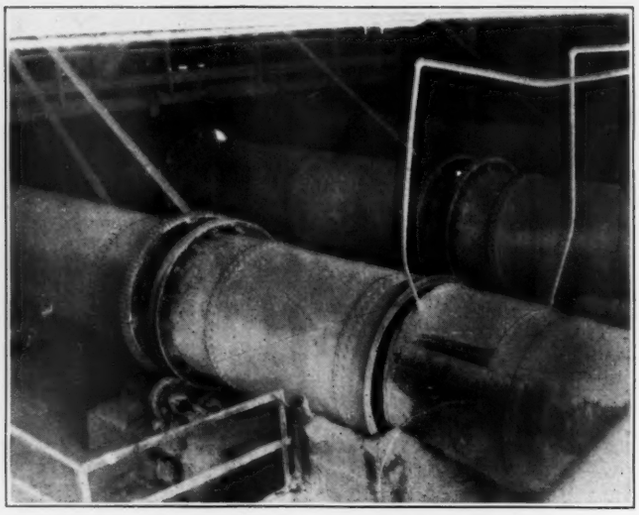
In the flotation mill the ore slime is treated with chemical reagents and sent through Janney flotation cells; the "tailings" from the latter form the raw material for the pulverized-limestone plant. The "tailings," in the form of a white limestone slime, have a total calcium-carbonate equivalent of

Loading with portable conveyor.



Vacuum pump in the filter house.

Shovel and locomotive on loading track.

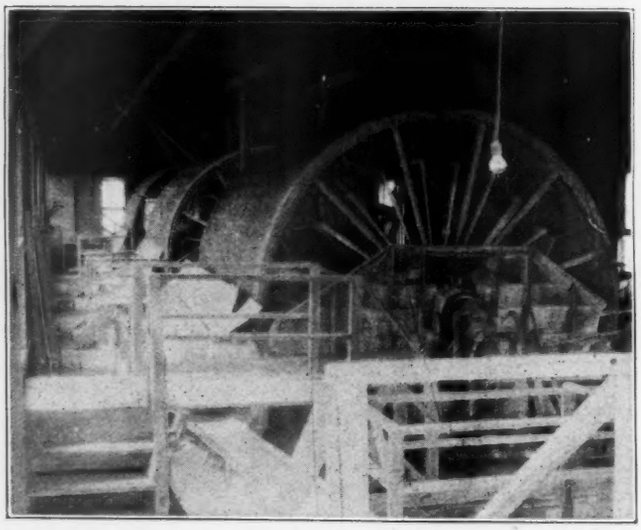


A view of the rotary driers.

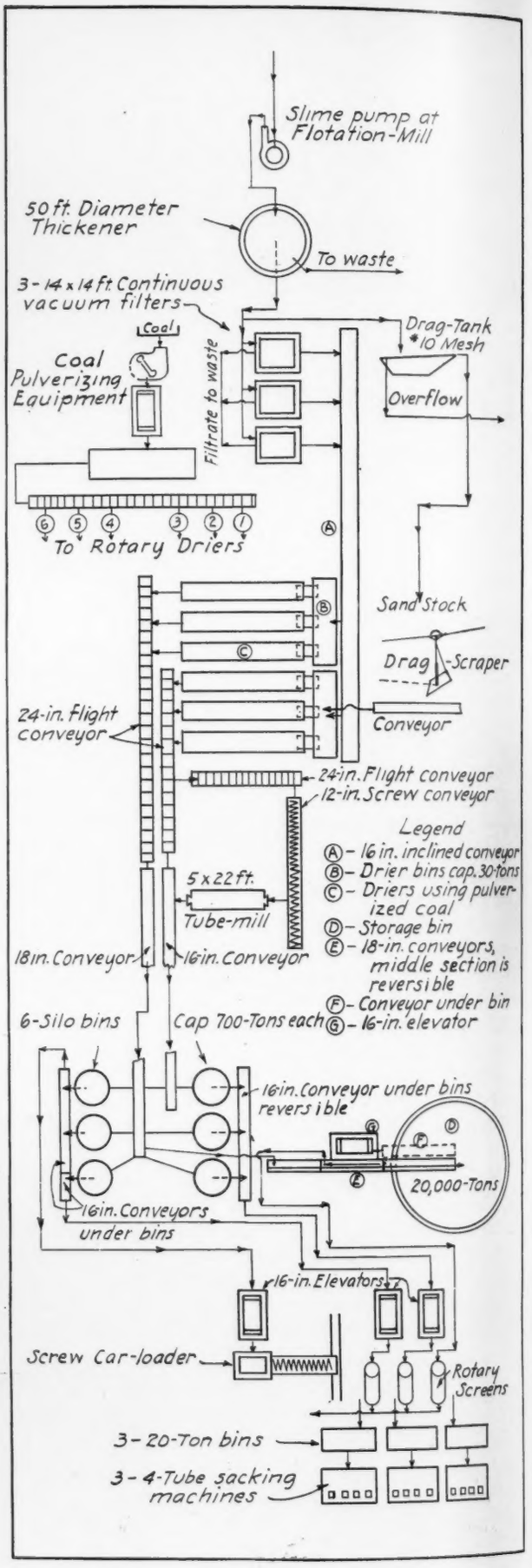
95 per cent. of which there is a calcium-carbonate content of 53 per cent. and magnesium-carbonate content of 36 per cent. The flotation "tailings" have a fineness sufficient to pass 80 per cent. through a 100-mesh screen. All limestone products show the same chemical analysis.

The pulverized-limestone plant, as the operation of the American Limestone Co., is distinctly separate from the milling and flotation plants of the American Zinc Co. and is located on a separate, although adjoining, tract of land. The limestone (slime) "tailings" from the flotation mill are pumped by means of a Wilfley 4-in. centrifugal pump to a Dorr 50-ft. thickening tank located at the pulverized-limestone plant. Here excess water is drained to a sump, whence a Wilfley 4-in. pump sends it to a drag-tank at the large storage pond. In the event of a shut-down of the limestone plant, the slime "tailings" from the flotation mill are bypassed to this pump to be disposed of in the storage-pond.

The drag-tank mentioned above is placed on the storage-pile of air-dried aglime for the purpose of recovering a certain size of material from the Dorr tank discharge. Another Wilfley pump delivers



Drum-type vacuum filters which remove moisture from the flotation-mill tailings.



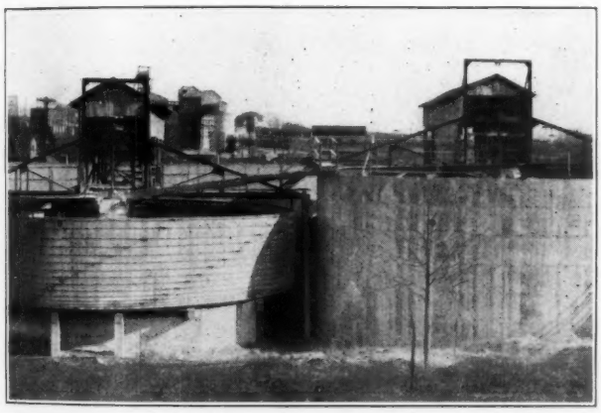
Flow-sheet of the American Limestone Co. plant showing progress of the material from flotation mill to packers.

the drag-tank waste water to any desired point of the pond. This pond, incidentally, is of no ordinary size; it stores 1,500,000 tons of air-dried pulverized limestone and covers a large area of land.

Paddle-scrapers operating at a speed of 1 r.p.m. on the low-pitched conical-shaped bottom of the Dorr thickening tank moves the settled "tailings" slime to the center of the tank, where a 4-in. line carries it to a Wilfley pump, which delivers it to the 3 Portland continuous vacuum filters. The latter are of the drum type, 14 ft. by 14 ft. in size. They operate at a speed of 1 rev. per 7 min. with a vacuum varying from 16 to 18 in. About 50 per cent. of the moisture in the limestone slime is removed through this process. The vacuum is produced by an Ingersoll-Rand pump driven by a 75-hp. motor.

From the filters the limestone cake is collected on a 16-in. belt-conveyor which extends for a length of 419 ft. to and over the top of the two drier-feed bins. This conveyor has a rise of 29 ft. and is driven by a 50-hp. motor.

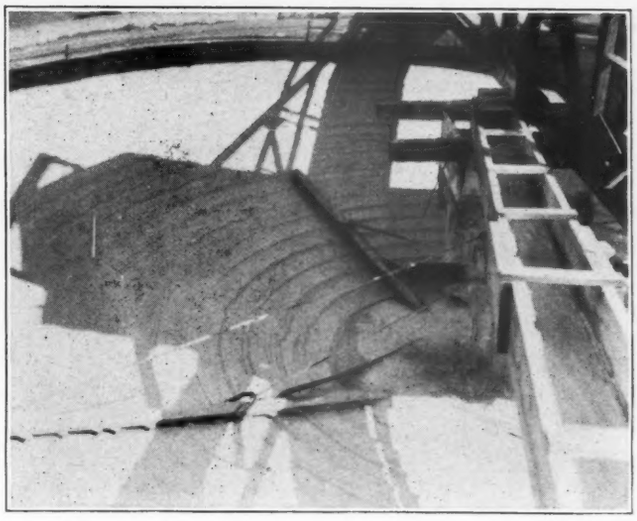
The drier-feed bins, each of which supplies three driers, have a total storage capacity of 300 tons



Classifying tank which takes the tailings from the flotation mill.

and the flow of limestone cake to them is controlled by flight feeders through ratchet-and-pawl drives. The six driers are Ruggles-Coles units, 5 ft. in diameter and 40 ft. in length; all are operated at a speed of 7 r.p.m. and their individual capacity is rated at 5 tons per hr.

Two systems of conveyors deliver the dried limestone to its ultimate destination in the storage-silo structure. One conveyor system receives the dried limestone from the first three driers and delivers it to a junction point over four silos. This system (No. 1) consists of a series of 24-in. belt-conveyors equipped with hot-material fabric belting and 18-in. belts and having a length of 589 ft. and a rise of 55 ft. The other system (No. 2) collects dried limestone from the last three driers. The material is delivered, by means of a by-pass conveyor and screw-conveyor, to an Allis-Chalmers tube-mill, where it is ground to a fineness suitable for asphalt filler. The discharge from the tube-mill is returned to the conveyor system, which then conducts it to a junction point over two of the silos. Should no asphalt filler be needed, the dried lime-stone from



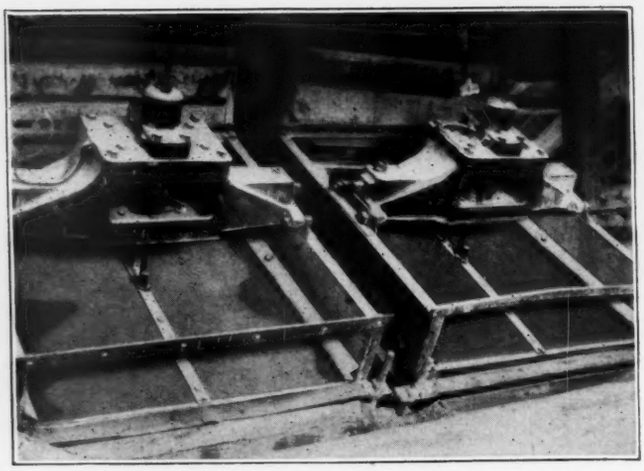
The 50-ft. tailings classifier nearly empty, showing paddles.

the driers is conducted direct to the silo storage system. The tube-mill is a 5-ft. by 22-ft. unit fitted with chilled liners and is operated at 21 r.p.m. by means of a 200-hp. motor and speed-reducer drive. It carries a 40,000-lb. ball load, and the product is ground to a fineness of 80 per cent. through a 200-mesh screen.

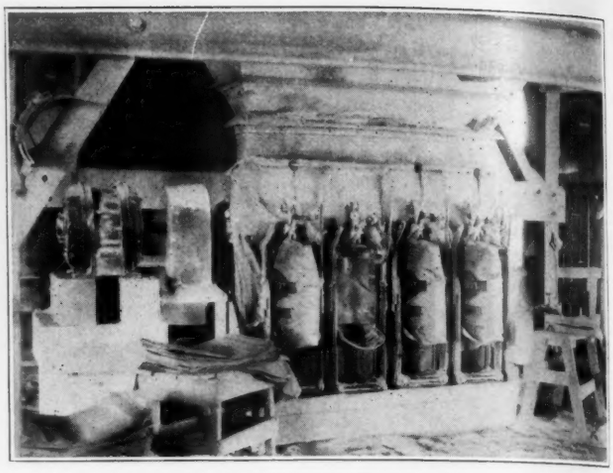
The driers are fired by pulverized coal. Each unit has a cylindrically-shaped furnace mounted in front. An Aëro Type A pulverizer supplies the pulverized fuel for each drier furnace and the units are operated individually according to requirements. Each pulverizer has its own coal hopper overhead; the coal is received in car-loads and is crushed to ¼ in. in size. A drag-conveyor then delivers it to the hoppers above the pulverizers.

The storage system consists of a group of silo-type bins and one circular bin located about 250 ft. from the group but connected to it by a conveyor system. The silo group consists of six reinforced-concrete units, each of which is 20 ft. in diameter and 54 ft. in height. The circular bin has a diameter of 120 ft. and a depth of 30 ft. With a 700-ton storage capacity in each silo and a 20,000-ton capacity in the circular bin, an aggregate storage capacity amounting to 24,200 tons is provided.

The driers, with pulverizing units in foreground.



Highway sand is screened to 6-mesh on these vibrators.

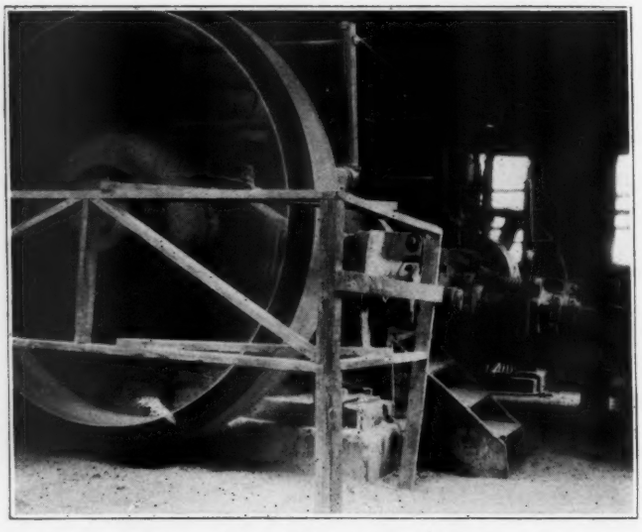


The four-spout bagging machine in the pack-house.

Inspecting the silo system of storage and reclamation first, it will be noticed that the silos are arranged in two rows of three units each. One row of silos has underneath it a 16-in. reversible belt-conveyor, 65 ft. long, for recovery of the material. It delivers to the boot of a 16-in. belt-bucket elevator which raises the material to a 4-ft. by 8-ft. revolving screen fitted with a 4-mesh screen cloth. The purpose of the screen is to eliminate any foreign material and lumps from the finished material prior to sacking. The screen discharges to a 20-ton bin over a Bates 4-tube sacker.

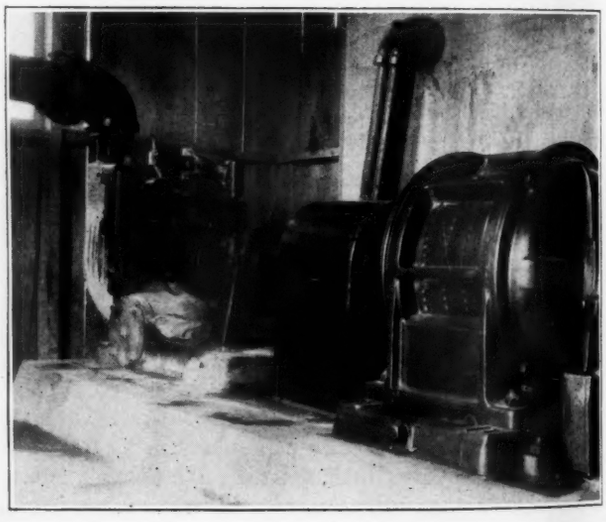
The second row of silos has a recovery system of two conveyors. Two silos, one of which stores a 10-mesh material and the other asphalt filler, have one conveyor for recovery. It discharges to a 16-in. belt-bucket elevator which feeds a screw-type box-car loader. Cars are loaded at the rate of 30 tons per hr. with this equipment.

The third silo in the row carries pulverized limestone, and material from it is recovered by a conveyor-elevator system which operates in a manner similar to that of the first row of silos already described. Its materials are likewise screened before sacking.



This roll-crusher produces highway sand from the jig-screen tailings.

Materials are delivered to and recovered from the circular bin by means of an overhead-conveyor system, which has its source of material at the junction point of the No. 1 conveyor system over the storage-silos. In the overhead-conveyor series there are three 18-in. units, totaling 267 ft. in length, the center unit being reversible. Materials are removed from this bin by a tunnel conveyor which is placed beneath it and discharges to the boot of a 16-in. bucket-elevator. The latter feeds



One of the limestone-slime pumps.

the reversible conveyor. A pack-house, located beneath the overhead-conveyor system, receives the recovered material from the reversible conveyor and, through a rotary screen and two Bates packers, this material is sacked for shipment. Three yard tracks served by the Southern Railway provide adequate car-loading facilities. Bulk shipments of air-dried limestone are made direct from the storage-pile. A locomotive-crane loads this material into railroad cars on a side track adjoining the storage-pile.

Railroad ballast, chatts and stone sand are processed in and shipped from facilities adjoining the milling department of the zinc plant—the source of these materials. About 50 per cent. of the ore milled, or about 900 tons per 24 hr., is rejected as

"tailings" from the three bull jigs and, after passage through a drag-tank, is sent by a 22-in. belt-bucket elevator to a launder, which delivers it over a distance of 419 ft. to the American Limestone Co. screening-and-loading plant or to stock-piles. The screening-and-loading plant consists of a timber-bin structure mounted over company yard tracks. Two 42-in. by 8-ft. revolving screens classify the "tailings" into ⅝-in. chatts, ¼-in. roofing chatts, ⅜-in. chatts, and railroad ballast. The weekly output of this plant is placed at 6,500 tons. Stock-piled chatts are recovered by a Marion shovel through an industrial-railway system consisting of a Vulcan 20-ton locomotive and a number of Western Wheeled Scraper Co. 8-cu. yd. dump cars. Loaded trains are drawn to a trestle above the plant-railroad side-tracks and are dumped to the gondola cars beneath.

Stone sand is produced from the bull-jig "tailings," which are sent through a Power & Mining Machine Co. roll-crusher. After crushing, the sand is elevated to a pair of Tyler Hum-mer screens fitted with 6-mesh wire-cloth panels. Rejected sand is returned to the tank, where the 100-mesh "fines" are taken out. The product of this cone is pumped by a Wilfley sand pump to an Anaconda classifier for further fine-sand separation. The final 6-mesh product is then stocked on a pile. Cars are loaded by means of a Barber-Greene portable conveyor which is also used for various loading and rehandling duties. The plant's capacity is about 1,800 tons of stone sand per week.

Symposium on Weathering of Masonry Materials Is Published

A symposium, including the papers and discussion at a session of the 1931 Annual Meeting of the American Society for Testing Materials, has just been published. It was sponsored by the Coördinating Committee on Weathering Characteristics of Masonry Materials to bring out current available data on the subject, and especially to emphasize those aspects which require further comprehensive and systematic research.

The serious economic aspects of masonry decay and its generally preventable character are discussed by one of the authors, who points out the importance of moisture penetration. Some of the weaknesses of concrete made without scientific control and steps to be taken to enhance the usefulness of this material are summarized. Consideration is given to the mechanism of weathering of structural clay products, as produced by wetting and drying, percolation of water, crystallization of soluble salts and action of the atmosphere.

The weathering of natural building stones and of slate are extensively discussed in other papers. An important contribution is the report of an investigation on weathering of aggregates to determine the durability of various crushed rocks and mortars and the development of an accelerated test to measure their resistance to weathering. Three of the included papers deal with the important subject of weathering tests. Tests for concrete, clay products and stone are concisely given.

To make the symposium as complete as possible, a section is devoted to an extensive bibliography and abstracts on masonry weathering. Able investigators have compiled references to natural stone, concrete, concrete masonry units and structural clay products.

Cement Mill Adds Slurry Filters to Cut Costs, Raise Output

(*Continued from page 23*)

There are also a Gould Triplex pump, which is belt-driven by a 15-hp. motor, and two smaller centrifugal pumps. All these are used for boiler-feed water. There are two air-compressors—one an Ingersoll-Rand Imperial Type XB, 9-in. by 12-in. by 12-in. unit which is belt-driven by a 50-hp. G.E. motor, the other a Laidlow Size 8 Type 3434 unit belt-driven by a 100-hp. G.E. motor—which furnish the air used for slurry agitation, air tools, etc. A Whiting 25-ton overhead crane spans the building and handles all the heavy machinery in it.

An Industrial Brownhoist locomotive crane with a 1½-cu.yd. clam-shell bucket and a gasoline crawler crane with a ¾-cu.yd. bucket perform general service about the plant.

Laboratories.—The chemical and physical laboratories are located at one end of the kiln building convenient to all operations. A Brown recording pyrometer gives the exit gas temperatures and, together with regular analyses of this gas, allows an accurate check of combustion efficiency to be made. Another Brown recording pyrometer registers the temperature of the cement going into and coming out of the storage-silos. This allows a double check to be made.

Other equipment in the laboratory includes a Riehle tensile tester, an Iler pulverizer, a Tyler Ro-Tap Sieve shaker, a ball-mill moist closet, and other customary equipment. There is a first-aid room near.

The company maintains blacksmiths, machine- and electrical-repair shops which are equipped to make almost any necessary repairs. Any heavy shaft work or other task that can not be handled at the plant is done in Bay City.

The plant office is a stucco building with concrete foundations and houses the general plant and engineering offices.

The main office of the Aetna Portland Cement Co. is in the Union Trust Bldg., Detroit, Mich. The officers are: F. R. Johnson, president; R. E. Paine, secretary and treasurer; and O. J. Lingemann, general manager. O. A. Dibble is general superintendent; S. Firestone is consulting engineer; and Paul Bischoff is chief chemist.

The company also operates a cement plant at Fenton, Mich., about 50 mi. northwest of Detroit, where it uses marl and clay as raw materials. These two plants, together with the warehouses at Detroit and Grand Haven, put the company in the position of being able to deliver by truck to any point in the southern or central parts of the state.

The National Ready-Mixed Concrete Assn.

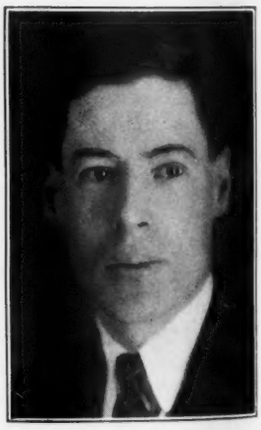
Its Officers for 1932

A. C. AVRIL
Secretary
(Avril TruBatch Concrete, Inc.)

J. E. BURKE
President
(Ready-Mixed Concrete Co. of Pittsburgh)

J. L. SHIELY
Treasurer
(Guaranteed Concrete Co.)

PAUL P. BIRD
Vice-President
(Boston Concrete Corp.)

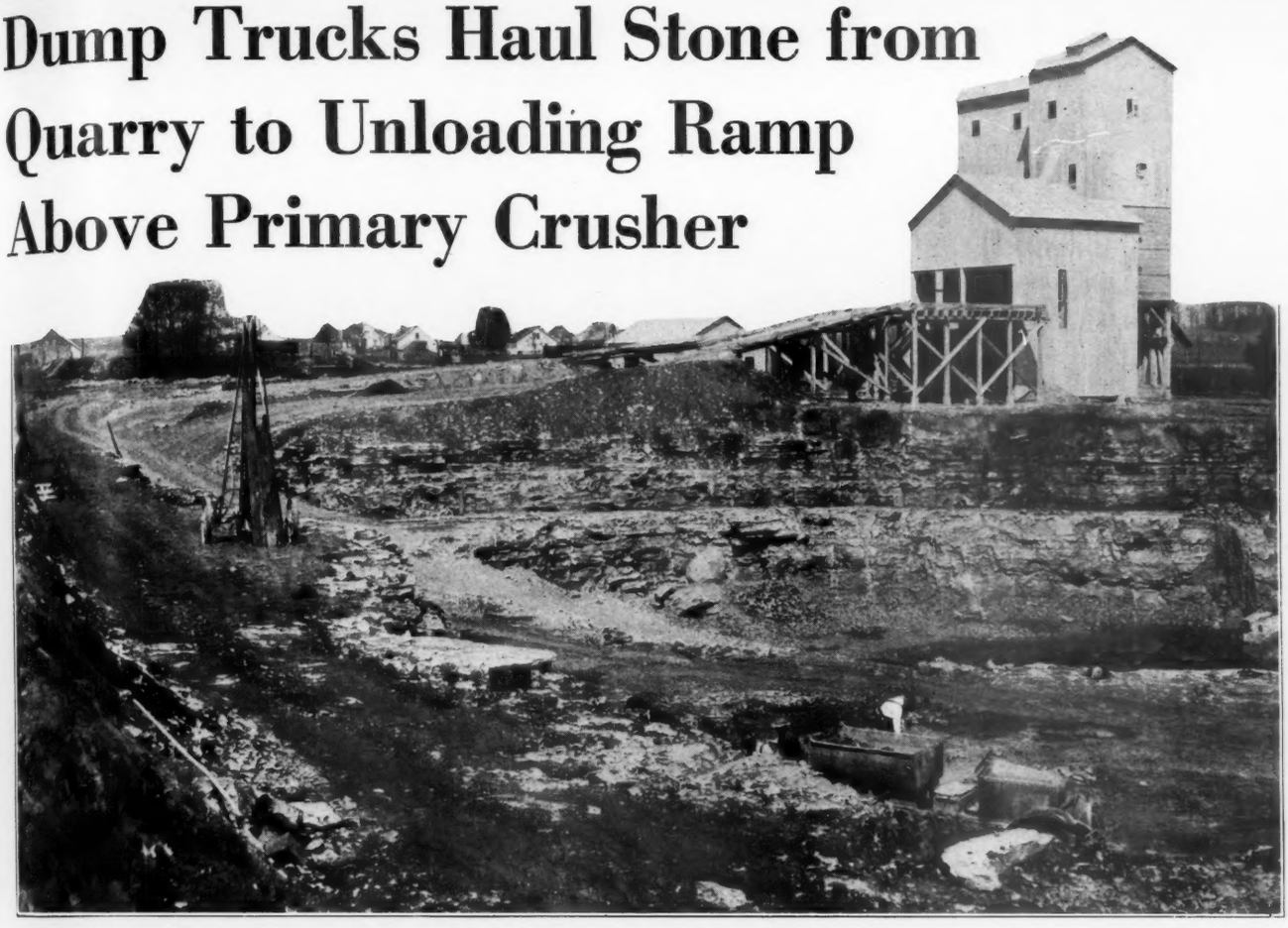


R. B. YOUNG
Vice-President
(Ontario Ready-Mix Concrete, Ltd.)

At Right—H. F. THOMSON
Vice-President
(General Material Co.)

At Left—A. F. FOSTER, Jr.
Asst. Treasurer
(The Warner Co.)

Dump Trucks Haul Stone from Quarry to Unloading Ramp Above Primary Crusher



The quarry and plant of the Hopkinsville Stone Co., Inc.

By W. E. TRAUFFER

ONE of the important features of the past year in the crushed-stone industry of Kentucky was the erection of a new and modern plant by the Hopkinsville Stone Co., Inc., at Hopkinsville, Ky. This plant, which went into operation on June 15, 1931, has a capacity of about 100 tons per hr. One of its principal features is its simplicity of design and construction. In spite of this simplicity the plant can produce any of the 9 sizes of aggregate included in the state specifications.

The plant is on a property of 14 acres located about 1 mi. north of the Hopkinsville city limits on federal highway No. 41. The deposit has been core-drilled to a depth of 70 ft. and good stone is known to exist to an even greater depth. The overburden of clay varies from 3 to 5 ft. in depth and contains considerable quantities of loose stone. This is removed by the steam shovel used in the quarry and hauled away in trucks. The rock is segregated and hauled to the plant to be crushed. A large part of the clay has been used for filling in low ground near the plant.

Unlike most quarry operations in this section the quarry is below the level of the plant, having been opened by means of bottom shots. The first level was opened to a depth of 12 ft. The rock on this level is stratified and somewhat broken. When this level had been sufficiently enlarged, a second level of 15 ft. was opened. Later another level will be sunk.

Drilling of the face is done with an Ingersoll-Rand X71 air-drill equipped with an air-hoist. One and one-fourth-in. hollow-round drill steel up to 30 ft. in length is used. Blasting is done in double-row bank shots of from 10 to 30 holes each. Both Illinois and Atlas explosives are used and shots are fired from the plant power-line.

The stone is loaded by an Erie ¾-cu.yd. steam shovel, supplemented by some hand labor, loading into three 1½-ton Ford dump trucks. These are at present hauling a distance of about 100 yd. to the plant. After operations become further removed from the plant several more trucks will be purchased. These will be equipped with hydraulic dump bodies. Still later, when operations are carried to a greater depth, an incline and cars will be installed to carry the material up out of the quarry. The trucks will then be used to haul from the shovel to the cars.

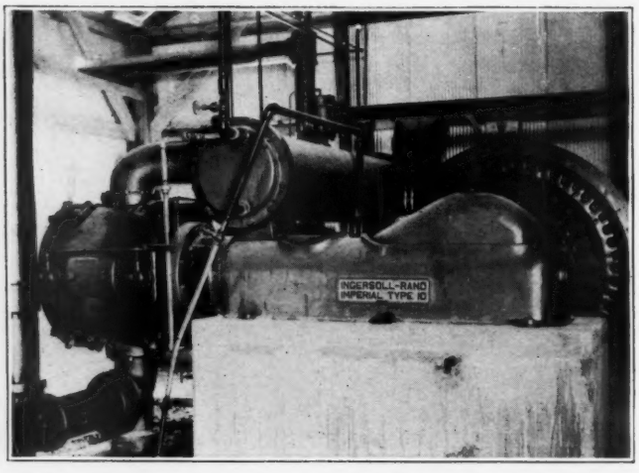
The trucks run up on a timber ramp at the plant and discharge directly to the primary crusher. This ramp is in the form of a semicircle and is wide enough to allow the trucks to back up to the crusher and then drive away without unnecessary maneuvering.

The primary crushing unit is a No. 107 Austin 15-in. gyratory crusher, belt-driven by a 75-hp. motor. This reduces the stone to 2½ in. and under and discharges through a chute to a belt-bucket elevator leading to the top of the screening build-

ing. The elevator has 24-in. buckets on a 10-ply balata belt and operates on 74-ft. centers. It is driven by a 50-hp. motor through belt and gear.

The elevator discharges through a chute to a 60-in. by 24-ft. heavy-duty revolving screen, the main barrel of which has 8 ft. of 1⅜-in., 6 ft. of 1¾-in., 5 ft. of 3-in., and 5 ft. of 4-in. perforations. The screen has an inner jacket with 7 ft. of ⅞-in. openings and an outer jacket with 6 ft. of ¼-in. openings. It is driven from the same motor and belt as the bucket-elevator and through a bevel gear.

The sizes from 1½ in. down are usually chuted direct to bin storage and the larger sizes to a Symons 3-ft. cone crusher, which is set to reduce to any sizes from ¾ in. to 1¼ in., depending on the product desired, and discharges through a

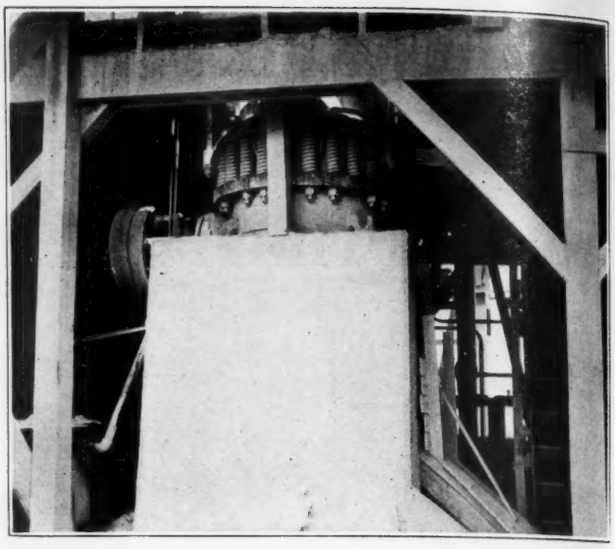


Air-compressor which powers the drills used in the quarry.

chute to the bucket-elevator previously described. Although this is the usual procedure, any sizes desired can be fed from the screen to this crusher. The cone crusher is belt-driven by a 60-hp. motor.

When stone for traffic-bound roads is being produced, the finer sizes coming from the screen go direct to storage. When the product is to be used for other purposes, the sizes from 1½ in. down go to a 4-ft. by 10-ft. Niagara double-deck vibrating screen. This has wire cloth with ⅝-in. openings

Steam shovel which loads trucks in the quarry.

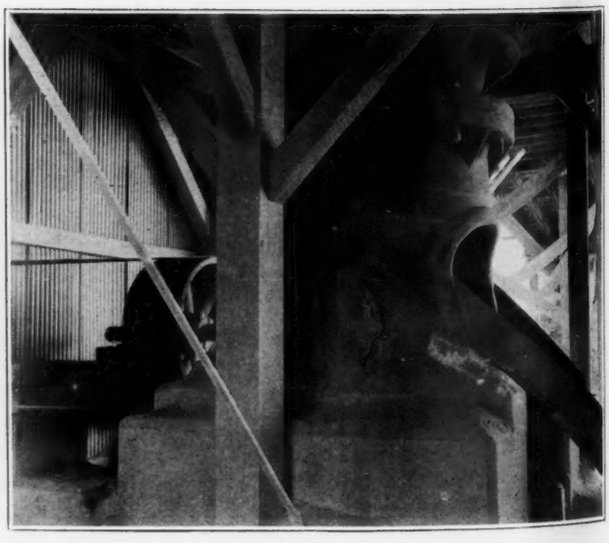


The 3-ft. cone recrusher. Elevator to the screens at the right.

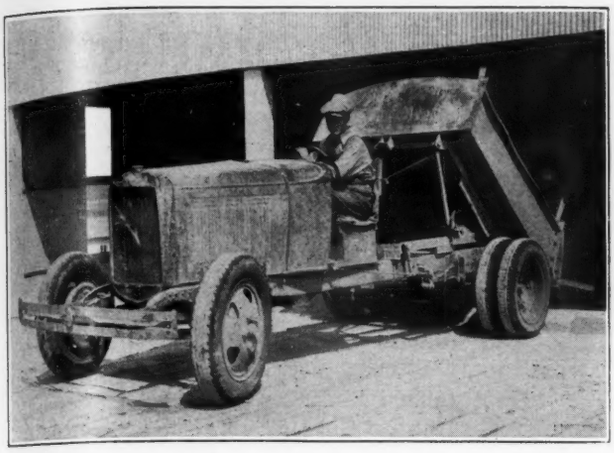
on the top deck and ⅛-in. openings on the bottom deck and is driven through a Dayton Cog-Belt drive by a 7½-hp. motor. All sizes produced by this screen go to storage, the minus-⅛-in. material being sold for agricultural limestone.

The storage-bin is of the timber-crib type with the interspaces filled. It has six compartments with a live capacity of 75 tons each. Each bin has a double bottom-discharge gate for loading railroad cars on a track beneath. Each set of gates is controlled by a handwheel and cable from a wooden runway beneath the gates. The use of these gates is said to reduce segregation in loading the cars. Trucks are loaded alongside the bin structure through segmental gates and drop chutes. The bins are reinforced with steel rods and rest on 12-in. steel I-beams which are supported by concrete foundations. The entire plant is of timber construction with concrete foundations and footings and is inclosed with corrugated-metal siding and roofing.

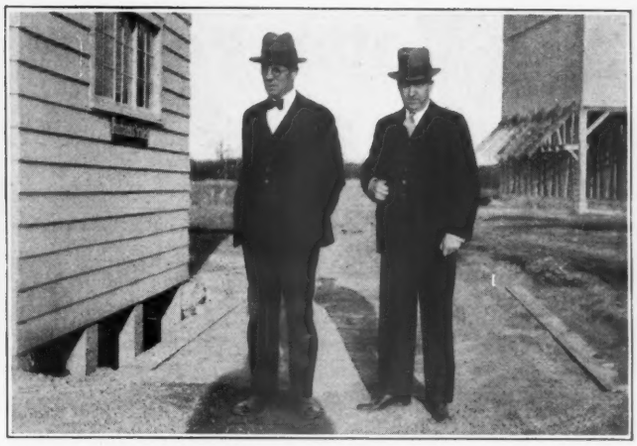
A timber building near the plant houses the machine-shop and repair-shop as well as miscellaneous parts and accessories. This building also



Primary gyratory crusher, with chute to elevator.



Truck on ramp discharging stone to the primary breaker.

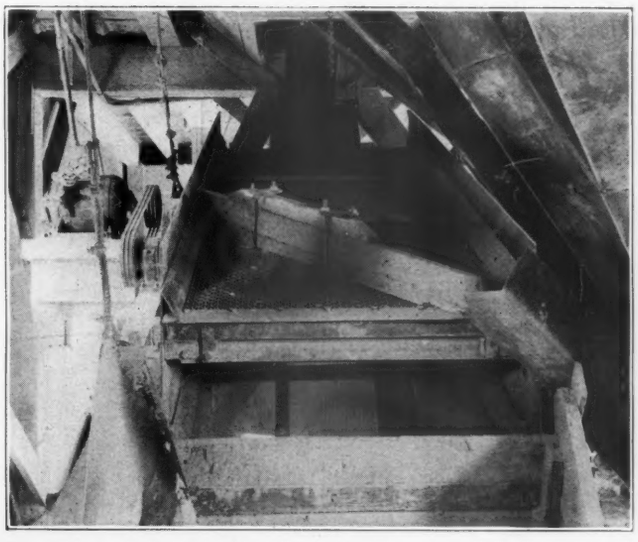


A. M. Andrew, secretary-teasurer, and President A. W. Porter.

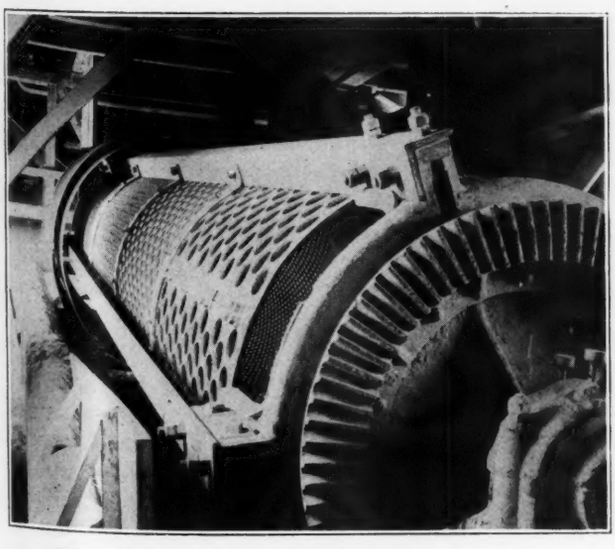
contains an Ingersoll-Rand Imperial Type 10, 15-in. by 12-in. by 9¼-in. air-compressor which is driven by a 125-hp. Westinghouse synchronous motor. This furnishes air for quarry drilling. A Westinghouse 3.5-kw. 125-v. direct-current generating set driven by a 15-hp. motor is used for excitation of the compressor motor. In addition there is an Ingersoll-Rand drill-sharpener and a fuel-oil furnace of the same make. This building is inclosed with corrugated-metal siding and has a sheet-metal roof.

Thus far about half of the business of the plant has been handled by trucks and most of the stone shipped has been used for highway construction. Considerable agricultural limestone has also been sold and the farmers in this part of the state are thoroughly convinced of its value but lack the funds necessary to purchase anywhere near their requirements. The fact that nine state roads radiate from Hopkinsville makes possible shipments by truck to any point within the shipping range of the plant. The fact that only three of these roads are at present paved insures a future demand for stone. The plant is also well located for rail shipments, being on the Louisville & Nashville Rwy. with a switch connection to the Illinois Central and Tennessee Central Rwys. The storage track at the plant holds 15 empty cars and 20 loaded cars, all which are moved by gravity. The plant is inside the switching limits of Hopkinsville.

The plant was designed by A. W. Partee, president of the company, in coöperation with the Austin-Western Road Machinery Co. which, through its agent, the Wilson Machinery & Supply Co. of Lexington, Ky., furnished most of the equipment. Westinghouse electric motors and equipment are used throughout the plant. All motors, except the motor driving the generator which uses 220 v., use 2,300-v. current.



The 4-ft. by 10-ft. double-deck vibrating screen. Chutes from revolving screen above.



The 60-in. by 24-ft. heavy-duty revolving screen.

The main office of the company is located at the plant and is an attractive wood-frame building, which houses a Fairbanks 15-ton truck scale on which all truck shipments are weighed.

The officers of the company are: A. W. Partee, president; Gates F. Young, vice-president; W. H. Petri, vice-president; A. M. Andrew, secretary and treasurer. The experience of these men makes them an ideal combination to be engaged in this industry. Mr. Andrew is an experienced producer and plant manager. Mr. Partee is a former highway engineer and is in close touch with this work. Mr. Petri is a former contractor.

Why Motor-Vehicle Tax Funds Should be Invested in Roads and Streets

By W. R. SMITH
President, American Road Builders' Assn.

MOTOR-VEHICLE taxes that have to do with the use of such vehicles were imposed at the very beginning for the purpose of improving the roads and streets over which motor vehicles operate. Such highway improvement reduces the operating costs of motor vehicles to the extent that the annual saving due to surfaced roads more than equals the cost of maintaining the highways and the capital investment in new improved roads built outside the cities.

Motor vehicles are dependent for their best operation on the existence of good roads. In addition, no other medium of transportation has been developed that does not depend on highways for its operation. Waterways serve those on the shores, railroads aid people at sidings along the route, airplanes reach only their landing fields. Improved highways fully equipped with motor vehicles connect passenger and freight stations inaccessible without them. From the raw material to the manufacturer, to the distributor, to the retailer, to the consumer, the highway plays an indispensable part.

New industries and more widespread use of commodities developed as a result of highway improvement have increased tremendously the business of other transportation agencies. The highways have persisted and grown in importance because of the service rendered to the public, and their usefulness has been multiplied many fold through the development of motor vehicles.

The gasoline tax was originally designed to be used only for the improvement of highways upon which motor vehicles are dependent. License fees, distinctly charged for the use of the public highways, have always been devoted to highway purposes. Through the development of these use taxes, which some claim might better be designated as road tolls, the cost of building country roads has been transferred almost entirely from real estate to motor vehicles. Owners of motor vehicles, who in general have suggested the imposition of such taxes and have not objected to them, are compensated in the decreased cost of operation on good roads. These taxes are a true measure of the benefit each taxpayer receives from the use of the highways. They apply locally to vehicles from other states. The use taxes on motor vehicles are said by experts on taxation to be the fairest and most nearly perfect form of tax that exists in the United States when the proceeds are applied to highways.

The gasoline tax and motor-vehicle fees return more than $1,000,000,000 for highways in states, counties, and cities. This is the major part of the cost of country roads. Real estate now pays scarcely a third of the road costs. Highway programs have become stable, so that roads are being built in an economical and systematic way with future improvements planned to meet the growing highway traffic needs, should road improvement ever succeed in catching up with the new developments and rapid growth in number of motor vehicles.

It has been suggested that our road systems are rapidly reaching completion. On the contrary, the task of building the highways of the United States hardly is begun. There are 3,200,000 mi. of country roads of which 700,000 mi. have been improved in varying degrees but only 138,000 mi. hard-surfaced. There are 2,500,000 mi. of highways that are still mud roads and subject to the "mud-roads tax" paid by motor-vehicle owners in the form of higher operating costs, increased depreciation, and greater up-keep expense. "We pay for our roads whether we have them or not" is held to be axiomatic by careful students of highway economics.

At the present rate of construction of state-road systems, reconstruction of the systems will be upon us before the state highways are completed. There are 101,000 mi. of primitive, unimproved roads included in the 324,000 mi. of the combined federal-aid and state highway systems, and only a small part of the federal-aid system has been improved with high-type surfaces. In cities streets must be widened and arterial highways constructed to allow vehicles to operate economically. In rural areas byways must be surfaced for motor-vehicle travel, roads widened, and the safety of traffic at high speed insured by adequate highways. All this work to keep up with new vehicle developments is in addition to the improvement of the 2,500,000 mi. of highways that are still primitive roads.

Suggested raids on the funds proposed, legislated, and paid by motorists seek to divert to purposes other than the construction and maintenance of highways the income from motor-vehicle taxes. Such diversion will breed dissatisfaction and can only result in the refusal of 25,000,000 motor-vehicle owners to continue to supply a revenue that is vital to economical, safe, and comfortable highway transportation.

Any diversion of these funds to meet other revenue needs, no matter how commendable the object, opens the way to replace other state taxes with those drawn from the motorist's fuel tank.

Since the earliest times highways have been serenely useful, interwoven with the daily life of everyone. To break down the normal, balanced and well-planned program of highway development made possible through motor-vehicle use taxes will be a severe blow to the economical, safe, comfortable, and expeditious public use of the highways. The comfort, happiness, and well-being of the whole Nation depends on the highways.

MEN OF THE INDUSTRY

The portrait printed on this page in each number of PIT AND QUARRY is selected without significance as to current events or the position of the individual in the industry.

F. C. BROWNSTEAD
Superintendent
Alpha Portland Cement Co.
Ironton, O.

Personal Mention

Fred Liby, an employee in the quarry of Meshberger Bros. at Linn Grove, Ind., suffered a fractured skull when he was struck by a flying stone during a recent blast. Mr. Liby sought refuge behind a power shovel when the blast was set off but the protection proved insufficient.

F. F. Reath, who has been chief chemist and assistant superintendent of operations of the Northwestern Portland Cement Co., of Seattle, Wash., has been promoted to superintendent. The announcement of Mr. Reath's promotion was made recently by **C. T. W. Hollister,** president. The company's plant is located at Grotto, Wash., and is reported to be operating almost at capacity.

Charles Parlier, an employee in the pit of the Neal Gravel Co. at Attica, Ind., was seriously injured recently when he fell from the top of a crane. He has been confined to a hospital at Danville, Ill., since the accident.

E. J. Burke, president of the National Portland Cement Co. of El Paso, Tex., reported to stockholders of the company recently that the company is preparing to float a bond issue to supply funds for an addition to the El Paso plant for producing white cement.

Hibbard S. Greene has resigned as general sales manager, Chain Belt Co., Milwaukee, to engage in life insurance underwriting in Milwaukee. He formerly was vice-president of the Barber-Green Co., Aurora, Ill.

H. E. Carney, Jr., in charge of sales for the Carney Cement Co., of Mankato, Minn., has opened a Northwest sales office at 614 Builders Exchange Bldg., Minneapolis, Minn.

L. R. Waslwanter is erecting sand-storage bins at 8713 El Tovar Place, West Hollywood District, Los Angeles, Cal.

Chris Schmohl and **Leo Hopla** of Arco, Ida., have entered into a contract with the Utah-Idaho Sugar Co., to quarry about 500 tons of limerock from their Arco quarry for shipment to the company's factory at Blackfoot, Ida.

H. M. Davison who has been manager of excavator sales for the Harnischfeger Sales Corp., Milwaukee, has left that organization. Mr. Davison is now in the East and is completing some plans in connection with a new organization, information concerning which will be issued shortly.

Ross Pepple, salesman in the lime division of the National Lime & Stone Co., for six years, has resigned to accept a similar post with the Ohio Hydrate & Supply Co. of Woodville, O. Mr. Pepple will travel the northwest Ohio territory, covering 22 Ohio and 3 Indiana counties. He makes his home at Lewisburg, O.

T. R. Barnum, superintendent of the plant and quarry of the Berea Quarries Co. at Berea, O., since 1916, has resigned. Mr. Barnum had been with the parent concern, Cleveland Stone Co., and its successor, the Cleveland Quarries Co., for more than 45 years. He began work at Olmstead Falls, O., operations in 1886 and continued there until he was transferred to Port Austin, Mich., in 1896, where he remained until he went to Berea to take charge of the company's subsidiary plant.

F. L. Stone, general sales manager, and **Paul C. Van Zandt,** assistant to the president in connection with operations and engineering, were elected vice-presidents at a meeting of the board of directors June 8 of the Universal Atlas Cement Co. of Chicago, a subsidiary of the United States Steel Corpn. Mr. Stone joined the Universal Atlas company over twenty years ago as a salesman. He became successively division sales manager, assistant general sales manager and general sales manager which latter position he has occupied since 1928. Mr. Van Zandt, vice-president in charge of operations, came to the Universal Atlas company after 30 years' engineering and operating experience in the cement-manufacturing field in the United States, Canada, Mexico, Cuba and the Orient. He is the inventor of the Compeb double-grinding mill known for its simplicity and economy. For 5 years he was chief engineer of the Asano Portland Cement Co. in Tokyo and prior to that was connected for 18 years with the Allis-Chalmers Co. in connection with cement-plant work.

G. E. Buell, sales representative for the Cowell Cement Co. at San Francisco, Cal., addressed the members of the Santa Rosa Builders' Exchange recently. Mr. Buell described the manufacture of Portland cement and the close control employed in the manufacturing processes.

A. L. Pitts, Sr., Buckingham, Va., will develop the Fountain Field slate quarry, near that place.

Philip Hoyt is contemplating the erection of a plant near Franklin, N. C., for the processing of kyanite to be mined locally.

Raymond Slaton has announced that plans will go forward shortly for the erection of a ready-mixed concrete plant at Sedalia, Mo.

Sewell L. Avery, president of the United States Gypsum Co., has been chosen to head a committee of Chicago bankers and business men to aid in the expansion of credit to business concerns in that area.

Obituary

George W. Page, vice-president and director of the W. A. Jones Foundry & Machine Co., Chicago, Ill., died at his home on May 29. Mr. Page had been with the company for 33 years, beginning his career as a shipping clerk in 1899. He was 51 years old.

George H. Lawrence, died recently at his home in Montreal at the age of 83 years. For many years he was superintendent of quarries for the Dominion Iron & Steel Co., Ltd.

Chester Cofoid, 49 years old, an employee in the pit of the Ottawa Road & Gravel Co., near Ottawa, Ill., met his death May 24 when he fell from the catwalk along a conveyor gallery at the pit. He suffered a fractured skull.

Coming Events

June 20-24, 1932. Atlantic City, N. J. Annual meeting of American Society for Testing Materials. C. L. Warwick, secretary-treasurer, 1315 Spruce St., Philadelphia, Pa.

July 14, 1932. St. Louis, Mo. Monthly meeting, St. Louis Quarrymen's Assn., Forest Park Hotel. E. J. McMahon, exec. sec., 4063 Forest Park Blvd., St. Louis, Mo.

October 3-7, 1932. Washington, D. C. Twenty-first Annual Safety Congress, National Safety Council. W. H. Cameron, secretary, 20 N. Wacker Drive, Chicago, Ill.

Traffic News and Comment

Recent I. C. C. Decisions

Crushed Stone.—Finding the rate on crushed stone, from Krause, Ill., to Capleville, Tenn., applicable and not unreasonable, the commission has dismissed the complaint in I. C. C. Docket No. 24,606, Shelby County Commissioners *v.* M. P. *et al.* (PIT AND QUARRY, Dec. 16, 1931, p. 73.)

Gypsum Rock.—On reconsideration the commission has found that the rate on gypsum rock, which moved over an indirect route from New Brighton, N. Y., to York, Pa., was unreasonable to the extent that it exceeded $2.10 prior to July 23, 1930, and has awarded reparation on that basis. In all other respects the findings in the original report, 179 I. C. C. 174, were affirmed. I. C. C. Docket No. 23,398, Medusa Portland Cement Co. *v.* Pennsylvania *et al.*

Bulk Lime.—Finding the rate on bulk lime from Mosher, Mo., to Charleston, S. C., not unreasonable, the commission has dismissed the complaint in I. C. C. Docket No. 24,595, Phosphate Products Corp. *v.* Missouri-Illinois *et al.*

Lime.—In several reopened cases involving the rates on lime between points in C. F. A., Trunk Line and New England territories, the commission has followed very closely the recommendations of the examiner as abstracted in PIT AND QUARRY, Jan. 27, 1932, p. 60. The point at issue was not the general level of the lime rates, but the fact that through the use of various descriptions lower rates might be obtained from certain shipping points. The various descriptions included building, chemical, glass, fluxing and agricultural lime. Basis scales of rates having been prescribed to apply on common lime, rates made by using 80 per cent. of the scale rate were published to apply between points within the three territories mentioned and between points in Trunk Line and New England territories. While the 80-per cent. rates applied between points in C. F. A. territory, they did not apply from points in C. F. A. territory to points in the eastern territories. In prescribing the 80-per cent. rates the commission said they should apply on the following description "Lime, agricultural or fluxing, having no commercial value for chemical or building purposes." While most of the shippers took the position that their fluxing lime fell in this class, others did not, and it was impossible to police shipments, as the carriers were unable to tell whether a shipment loaded in bulk was composed of building or fluxing lime. There was some contention that a lower rate should be accorded to run-of-pot-kiln lime on account of the impurities it contains. Feeling that to provide any more descriptions on low-grade lime would perpetuate a situation which required correction, the suggestion was not accepted.

Complainants and interveners were generally in accord in proposing that no distinction be made in the nature or kind of lime, but that alternative rate and weight bases be prescribed in lieu thereof, that is, a basic scale on all lime with the minimum requirement of 30,000 lb., with rates made 80 per cent. of that scale for shipments of 50,000 lb., or more. The commission found that the rates previously prescribed on common lime, car-load minimum weight 30,000 lb., were not unreasonable or unduly prejudicial, but that they are and for the future will be unreasonable when applied to shipments of 50,000 lb. or more to the extent that they exceed or may exceed 80 per cent. of the rates on common lime, minimum 30,000 lb., between the same points.

In support of the dual-minimum basis the commission said: "We have prescribed or approved the dual or alternative basis of rates on lime in the South and between points in the North and South in North American Cement Corp. *v.* A. & R., 153 I. C. C. 431, 163 I. C. C. 701, and two scales of rates on lime from Martinsburg and Berkeley, W. Va., to destinations in Virginia. The basis scale applied on a minimum of 30,000 lb., and 80 per cent. thereof for a minimum of 50,000 lb. That basis was also approved for application in southern territory in 129 I. C. C. 635. Likewise, in 167 I. C. C. 520, the alternative basis of rates on lime was approved from Alabama, North Carolina, Georgia, Kentucky, Tennessee, Virginia, West Virginia, Maryland, and Pennsylvania, to destinations in Tennessee, Virginia, North Carolina, and South Carolina. In Dann Gerow Co. *v.* A. C. L., 172 I. C. C. 428, alternative rates cn lime were prescribed from various points in southern territory and from origins in Ohio to St. Petersburg and Clearwater, Fla." I. C. C. Dockets, No. 19,957, Northwestern Ohio Lime Mfrs. *et al. v.* Pennsylvania *et al.* No. 16,170, Eastern Lime Mfrs.' Traffic Bureau *et al. v.* A. & B. B. *et al.* No. 16,170, Sub. No. 1, Washington Building Lime Co. *et al. v.* A. & B. B. *et al.*, No. 19,951, Ohio Hydrate & Supply Co. *v.* Pennsylvania *et al.*, No. 20,234, Acme Glass Co. *et al. v.* P. R. R. *et al.*, and No. 20,234 Sub. No. 1, Berney-Bond Glass Co. *v.* P. R. R. *et al.*

Examiners' Reports

Sand and Gravel.—Examiner Burton Fuller recommends that the commission find the rates on sand and gravel, from LaGrange and Reading, Mo., to destinations on the C. B. & Q., in Illinois, unreasonable to the extent that they exceed or may exceed rates to key points shown in an appendix. Representative proposes rates a net ton from LaGrange are: to Mendon, 76 c.; to Monmouth $1.10; to Brighton $1.13; to Lowder $1.26; and to Shattuc $1.39. From Reading he suggests: to Marble Read 80 c.; to Silver Lake $1.01; to Galesburg $1.13; to Concord $1.26; and to Hookdale $1.39. I. C. C. Docket No. 24,568, Missouri Gravel Co. *v.* C. B. & Q.

Terrazzo Material.—Examiner H. P. Haley proposes that the commission find the rates on crushed stone or marble terrazzo material, from Tate, Ga., to New Orleans, La., not unreasonable or otherwise unlawful, and to dismiss the complaint in I. C. C. Docket No. 24,911, Builders' Assn. of Kansas City, Mo. *v.* L. & N.

Gravel.—Examiner John Davey recommends dismissal of the complaint on finding that the rates on gravel from Garysburg, N. C., to Adams Grove, Capron, Lawrenceville, Nurney and South Hill, Va., are applicable. I. C. C. Docket No. 24,338, Southern Traffic Service *v.* A. C. L. *et al.*

New Complaints Filed

Gravel.—Reparation is sought on an allegation of unreasonable rates and charges on gravel, from Oreapolis, Neb., to Emerson, Hastings, Hepburn and McPherson, Ia., and from Lewisville and South Bend, Nebr., to Hepburn, Ia., in I. C. C. Docket No. 25,278, Harrison Engineering and Construction Corp., Kansas City, Mo. *v.* C. B. & Q.

Limestone.—Rates in violation of Sec. 1 and 3 on fluxing limestone or crushed or broken limestone, from Myerstown, Pa., to points in Pennsylvania, Ohio and New Jersey, are alleged, with shippers in the Thomasville, Pa., district unduly preferred. Cease and desist order and new rates are sought in I. C. C. Docket No. 25,270, Calcite Quarry Corp., Philadelphia, Pa. *v.* Reading *et al.*

Silica.—Reparation is sought on an allegation of unreasonable rates on silica, from Rogers, Ark., or St. Louis, Mo., to Hobbs, N. M., and Jackson, Miss., in I. C. C. Docket No. 25,260, Corona Silica, Inc., Rogers, Ark. *v.* G. M. & N. *et al.*

Sulphur.—Unreasonable rates on sulphur, from Byrum, Tex., to Corpus Christi, Tex., for export or coastwise movement, are alleged and new rates and reparation asked for in I. C. C. Docket No. 25,257, Duval Texas Sulphur Co., Houston, Tex. *v.* Texas Mexican.

Rate-Committee Dockets

New England Freight Assn.

Crushed Stone, Sand and Gravel.—To establish a rate which will secure movement for the rail carrier instead of handling direct from a near pit to the job, shippers propose that the rate on crushed stone, sand and gravel, in straight or mixed car-loads,[1] from North Wilbraham and Westfield, Mass., to Pittsfield and West Pittsfield, Mass., be reduced from $1.00 to 80 c. per net ton.—Docket No. 25,302.

Lime.—Carriers propose to reduce the rate on lime in bulk, in bags or in barrels, car-load minimum weight 40,000 lb., from Canaan and East Canaan, Conn., Lee and West Stockbridge, Mass., to New York Central stations in New York City, 33rd St., 60th St., and 130th St., to 13 c. per 100 lb.—Docket No. 25,300.

Trunk Line Assn.

Cement.—Shippers propose the establishment of a rate of 9 c. per 100 lb. on cement in shipping containers, loaded on container cars, car-load minimum weight 120,000 lb., from Alsen, N. Y., to Newburgh, N. Y., the proposed rate to include transfer from cars at Newburgh. This rate is now applicable in ordinary service —Docket No. 29,229.

Crushed Stone.—Shippers propose the addition of Syracuse, N. Y., as an origin point to all tariffs on crushed stone now in effect from Jamesville and Rock Cut, N. Y., to points on the D. L. & W. and connections.—Docket No. 29,209.

Lime.—A reduction in the 5 c. arbitrary over Philadelphia, which now applies on lime from C. F. A. territory to Millville, N. J., to 2 c. per 100 lb., is proposed by shippers.—Docket No. 29,192.

Sand.—An increase in the rate on engine, blast and molding sand, also on ground flint, from Berkeley Springs and Great Capacon, W. Va., to Bradford, Pa., by cancellation of the commodity rate of $2.75 per net ton, is proposed by carriers.—Docket No. 28,814, Sup. 1.

Carriers propose to change the description on sand moving on a rate of 70 c. per ton from Cascade, Sturgisson, and Greer, W. Va., to Fairmount, W. Va., from "Sand, other than blast, engine, foundry, etc.," to "Sand, damp (not artificially or mechanically dried)".—Docket No. 29,190.

Carriers propose the establishment of rates on sand from Downer, Williamstown and Williamstown Jct., N. J., to Newport News, Va., of $4.15 per ton in open-top cars, and $4.50 per ton in box-cars or other closed equipment.—Docket No. 29,079, Sup. 1.

Sulphur.—Carriers propose to publish a rate on sulphur (brimstone, unground or unrefined), car-load minimum weight 60,000 lb., from Philadelphia, Pa., to Burlington, Ont., and from Philadelphia, Pa., and Baltimore, Md., to Sulphide, Ont., of 28 c. per 100 lb.—Docket No. 28,994. Sup. 3.

Central Freight Assn.

Agricultural Limestone.—A line of rates on agricultural limestone, car-load minimum weight 60,000 lb., from Genoa, Martin, Marblehead, and Danbury, O., to destinations in the lower peninsula of Michigan, based on the usual mileage scale, is proposed by shippers. Complete copy of exhibit showing proposed rates will be furnished on request.—Docket No. 31,-488.

Crushed Stone.—Shippers propose the establishment of a rate of $1.10 per net ton on crushed stone and related articles from Painesville and Perry, O., to Mill Village, Pa.—Docket No. 31,492.

A reduction in the rate on crushed stone from Marblehead, O., to South Bend, Ind., to $1.45 per net ton, is proposed by shippers.—Docket No. 31,561.

Dolomite.—Shippers propose a reduction in the rate on raw dolomite or fluxing stone from Genoa, Martin and Marblehead, O., to St. Louis, Mo., from $3.15 per net ton to $2.27 per gross ton.—Docket No. 31,514.

Quarry Waste.—A reduction in the rate on quarry waste or tailings from Sibley, Mich., to Cement City, Mich., from 70 c. to 60 c. per net ton, car-load minimum weight 120,000 lb., is proposed by shippers.—Docket No. 31,490.

Sand.—A reduction in the rate on common sand from Wolcottville and Winona Lake, Ind., to Van Wert, O., from 75 c. to 70 c. per net ton is proposed by shippers.—Docket No. 31,-523.

Sand and Gravel.—A reduction in the rate on sand and gravel from Cleveland, O., to Aurora, O., from 80 c. to 70 c. per net ton is proposed by shippers.—Docket No. 31,508.

Carriers propose to increase the rate on sand and gravel from Erie, Pa., to Pittsburgh, Pa., from $1.20 to $1.60 a net ton.—Docket No. 31,535.

Shippers propose a reduction in the rate on sand and gravel from Navarre, O., to Wooster, O., from 80 c. to 70 c. per net ton.—Docket No. 31,568.

Illinois Freight Assn.

Crushed Stone.—It is proposed to reduce the rate on crushed stone and related articles, car-load minimum weight 120,000 lb., from Lehigh, Ill., to Kankakee, Ill., from 38 c. to 25 c. per net ton.—Docket No. 6,637.

Western Trunk Line Committee

Cement, Lime, Plaster and Stucco.—To provide a rule allowing mixed-car shipments of cement, lime, plaster and stucco, from Boettcher, Colo., and Laramie, Wyo., it is proposed to include these points of origin in W. T. L. Tariff 133-G, Item 105-A.—Docket No. 5,773-A.

Feldspar.—It is proposed to reduce the rates on feldspar to Sun Prairie, Wis., from Erwin, Tenn., from $7.01 to $6.61 a net ton; from Keystone, S. D.,[2] from 35 c. to 30½ c. per 100 lb.; and from Warroad, Minn., from 30 c. to 27 c. per 100 lb.—Docket No. 6,141-H.

Sand and Gravel.—Reduced rates on sand and gravel,[1] made on a mile-age-scale basis from Winona, Minn., to destinations in Wisconsin, are proposed. A complete copy of exhibit will be furnished on request. Representative rates are shown below. —Docket No. 5,701-A.

Miles	Present	Proposed
5	$0.75	$0.46
10	.75	.50
15	.75	.52
20	.75	.56

Southern Freight Assn.

Feldspar.—Shippers propose the establishment of the following rates per net ton on feldspar, car-load minimum weight 50,000 lb., to Floreffe, Pa. From Erwin, Tenn., $4.68; Minpro, Spruce Pine and Tocane, N. C., $4.80; Bowditch and Cane Branch, N. C., $5.04.—Docket No. 57,936.

Southwestern Freight Bureau

Cement.—Shippers at Spocari, Ala., propose the establishment of a rate of 47 c. per 100 lb., on cement, car-load minimum weight 50,000 lb., to points on the Texas-New Mexico Ry.—Docket No. 24,801.

Lime.—To put Sapulpa, Okla., on the same basis as Tulsa, shippers of lime at Mosher and Ste. Genevieve, Mo., propose a rate of 16 c. per 100 lb., on ground lime in bulk, car-load minimum weight 50,000 lb.—Docket No. 24,811.

[1] The car-load minimum weight will be 90 per cent. of the marked capacity of the car, except that when loaded to its full cubical or visible capacity, the actual weight will apply.

[2] The car-load minimum weight will be the marked capacity of the car, except that when loaded to its full cubical or visible capacity, actual weight will apply.

Book Review

HARTRAMPF'S VOCABULARIES. *548 pp. The Hartrampf Co., Atlanta, Go. Price $5.00.* Anyone who has occasion to use words—and who does not—will find this volume a most valuable addition to his library. It is a condensed book of synonyms, antonyms and relatives and is so arranged that by quick reference one may find the exact word to express his thought. Whether you are composing an important letter, writing a speech for your convention, or preparing an advertisement for your product, it is often difficult to choose the exact word to express the idea to be conveyed. Suppose, for example, in describing your product you wished to convey to the reader the excellence of the material. The word "excellent" hardly tells the story, but the book quickly shows that "outstanding," "incomparable," "matchless," "peerless," "unequaled," or any one of a score of other words might better describe it. Although it does not attempt to replace the dictionary, it would certainly be of more value to the business man in most instances.

Financial News

The information contained in these financial pages is given with the understanding that any statement on the part of this magazine or any of its staff, as to the responsibility or standing of any person, firm or corporation, or as to the value of any property or securities is a mere expression of opinion, given as a matter of service to the readers of PIT AND QUARRY, *for which no responsibility in any way is to attach to this magazine or to any of its staff.*

Sulphur Companies Earn Dividends; Prices Firm

With the smallest volume of business since 1922, sulphur companies will nevertheless show their current dividend requirements covered in the first half of this year. Both the Texas Gulf Sulphur Co. and Freeport Texas Co. are now on a $2 basis against a $4 basis a year ago, having made two reductions in the rate of payment. The present rates were established in the hope that current rate of sulphur consumption is close to the country's minimum requirements and that they can therefore be maintained.

Texas Gulf increased inventories in 1931 to $14,192,158 against $11,928,750 in 1930 and $8,731,960 in 1929. Freeport's inventories were $6,591,107 against $5,251,467 in 1930 and $4,036,855 in 1929. Texas Gulf showed a decline in cash to $3,477,002 on December 31, 1931, from $5,488,050 in 1930. Freeport's cash declined to $2,154,029 from $3,431,763 in 1930. It is probable that both companies will endeavor to reduce their output this year in order to increase cash by selling from inventory. Freeport has been reducing inventories since last November.

Texas Gulf Sulphur reported a net profit of $1,722,535 equal to 68 c. a share in the first quarter against $2,448,198 or 96 c. a share in the 1931 period. In the full year 1931 net profit was $8,942,602 or $3.52 a share against $13,972,085 or $5.50 a share. Net profit in the second quarter probably will be less than in the first quarter of this year.

Freeport Texas Co. does not report earnings quarterly but it has been officially stated that net profit in the first three months was slightly ahead of profits in the 1931 first quarter. The small gain was due to a larger portion of shipments from Freeport's wholly owned mound during the period rather than from the dome owned jointly with the Texas (oil) Co. In the first six months of 1931 Freeport reported $1,185,092 net profit or $1.62 a share on 729,844 shares of capital stock.

Freeport earned $2,376,782 or $3.26 a share in the full year 1931 against $3,124,185 or $4.85 a share in 1930.

One Price Which Holds

The price of sulphur has remained steady at $18 a ton over the last three years in this country, with the two principal producers convinced that a lower level would not stimulate demand. This price will make it possible for Texas Gulf Sulphur and Freeport Texas Co. to cover current dividend rates (both are paying 50 c. quarterly) for the first half of this year, though volume is only about 50 per cent. of what managements would consider normal.

U. S. Gypsum Co. to Net 80 Cents in Six Months

Despite a continued decline in construction the United States Gypsum Co., according to present indications, will report net profits for the first half of 1932 somewhat in excess of preferred and common dividend requirements. This means net for the first six months of around $1,300,000, equivalent after preferred dividends to about 80 c. a share on 1,217,472 common shares outstanding, against $2,241,560 or $1.62 a share on 1,216,956 shares in the first half of 1931.

Since March 1 the company's business has been nearly equal to that of the like 1931 period. In the first quarter its profits were slightly less than preferred dividend requirements. However, that period normally is the dullest season for the gypsum industry and even in U. S. Gypsum's best years its profits in first quarters were not large.

In recent years the company has perfected several products for use in modernizing and repairing buildings and for use outside the building field, the combined volume of which will stand it in good stead this year during the general slump in new construction.

The company has declared its regular quarterly dividend of $1.75 on each share of preferred stock and 40 c. on the common stock, payable June 30 to stockholders of record June 15.

Arundel Corp. Earns $1 per Share in 4 Months

Arundel Corp. of Baltimore, Md., (sand and gravel producers and contracting business) reports for the four months ended April 30, 1932, net profit of $493,283 after depreciation, federal taxes, etc., equivalent to $1 a share on 492,556 no-par shares of capital stock. This compares with $646,124 or $1.31 a share in the first four months of 1931.

April net profit was $114,971 after depreciation, federal taxes, etc., against $239,985 in April, 1931.

Current assets as of April 30, 1932, were $3,407,867, which does not include the $2,000,000 owed the company by the state of Florida, and current liabilities were $292,296.

International Cement's Directors Halt Dividend

Directors of the International Cement Corp. have taken no action on the quarterly dividend of 50 c. on the common stock due at this time.

The company reports for the quarter ended March 31, 1932, net loss of $409,713 after depreciation, interest, reserve for contingencies, etc. This compares with net profit of $410,909, equal to 65 c. a share on 636,085 no-par shares of stock in first quarter of 1931.

Income account for the quarter ended March 31, 1932, compares as follows:

	1932	1931
Gross sales	$3,219,764	$6,111,424
Expenses, etc.	2,834,008	4,878,748
Depreciation	466,970	467,626
Loss	$ 81,214	*$765,050
Int., tax, contg., etc.	328,499	354,141
Net loss	$ 409,713	*$410,909

* Profit.

CURRENT DIVIDENDS

Company	Class of Stock	Dividend Rate	Holders of Record	Payable	Company	Class of Stock	Dividend Rate	Holders of Record	Payable
Alpha Portland Cement	Preferred	$1.75 qr.	June 1	June 15	Pittsburgh Plate Glass	Common	$0.25	June 10	July 1
Canada Cement Co	Preferred	$1.62½ qr.	May 31	June 30	Raybestos-Manhattan	Common	$0.15 qr.	May 31	June 15
Cleveland Quarries	Common	$0.10 qr.	May 15	June 1	Riverside Portland Cement	Preferred	$1.50 qr.	Apr. 15	May 1
Consolidated Sand & Gravel	Preferred	$1.00 qr.	Apr. 30	May 16	Standard Paving & Materials	Preferred	$1.00 qr.	Apr. 30	May 16
Fitzsimons & Connell	Common	$0.50 qr.	May 21	June 1	Superior Portland Cement	Class A	$0.27½M	June 23	July 1
Great Lakes Dredge & D	Common	$0.25 qr.	May 4	May 14	Texas Gulf Sulphur	Common	$0.50 qr.	June 1	June 15
International Salt	Common	$0.37½ qr.	June 15	July 1	U. S. Gypsum	Preferred	$1.75 qr.	June 15	June 30
Owens-Illinois Glass	Common	$0.50 qr.	Apr. 29	May 15	U. S. Gypsum	Common	$0.40 qr.	June 15	June 30
Owens-Illinois Glass	Preferred	$1.50 qr.	June 1	June 15	Worcester Salt	Preferred	$1.50 qr.	May 9	May 15

Review of Foreign Practice

New Uses Stimulate French Gypsum Trade

An article appearing in *Revue des Materiaux de Construction* several years ago summarized a number of new applications of rock gypsum, principally those concerned with the winning of various sulphates and of sulphuric acid; these uses are of particular significance to France because that country is rather poor in pyrites. These processes have reached a stage of industrial importance, and it is principally due to them that the production from one locality—that along Ariege River—has grown from 50,000 to 217,000 metric tons. Of this increased production, 150,000 tons comes from one large new plant at Bedeilhac, that of the Office National de l'Azote.

Bedeilhac is located in the mountains on the left side of the Ariege River a little above Tarascon-sur-Ariege and about 4 km. from the railroad between Toulouse and Ax-les-Thermes. The gypsum deposit there has been known and worked for some time, but with the recent increase in production an interesting aërial tramway 3,970 meters (about 13,000 ft.) long has been built to connect with the railway. This tramway, of the bicable type, descends 92 m. (300 ft.) from the mountain site. Its loading station is unusual because it is entirely underground, connecting with the mine-haulage system. The tramway has a carrying capacity of 50 metric tons an hr.

The gypsum at Bedeilhac is of Triassic age, and is associated with a deposit of marl. The exact extent of the deposit is not known.—V. Charrin in *Revue des Materiaux de Construction*, No. 270, pp. 96-97, March, 1932.

Sand Works in Germany In Operation 50 Years

On April 1 this year the Bokshorn sand works at Veltheim, Weser, Germany, celebrated the fiftieth year of its existence. This business has had a particularly interesting history, for from a very small beginning it has grown to be one of the largest businesses of its region. The deposit was located by railway officials, who in 1874-75 were building a new line near, and used the material in its natural state for constructing the roadbed. Some years later Heinrich Franke, manager of a large coal company, bought the whole hill in which the deposit occurs, and began the separation of gravel from sand, first with the old-time hand sieves, such as masons still use, and later with simple gravity screens.

The sand at first was wasted, and in a short time so much sand accumulated around the foot of the hill that the excavation had to be moved higher up. The first washing plant was installed in 1883-84; the sand and dirt were removed in a rotary screen, and the washed gravel was carried down to the loading plant in a long pipe. The little village of Veltheim "boomed;" about 120 workers were employed in two shifts. The removal of the quantities of dirty water was a serious problem, and in 1887 the owners entered the brick business, using fine clay obtained by settling the waste water from the gravel screens. In 1893 to 1896 the company erected and equipped a first-class machine-shop, capable not only of repairing but also of manufacturing some of the needed equipment. About this time a crushing plant was added, to reduce the bowlders occurring in parts of the deposit. The greatest single event in the history of the business was the complete electrification of the works in 1909. In 1910 a concrete-products plant was installed. As the demand for sand had also been growing, a sand-washing installation was added in 1912 and enlarged in 1916. The pit is still owned by the Franke family, and the well-diversified nature of its production has kept the business in a thoroughly substantial condition. The present capacity in washed gravel is 1000 metric tons a day; in the 50 yr. of the business about 10,000,000 cu. m. has been excavated from the deposit.—*Tonindustrie-Zeitung* 56:435-436, April 21, 1932.

New German Standards for Cements Approved

Germany's new official standard specifications for Portland cement, iron-Portland cement and blast-furnace cement, the first draft of which was published in September, 1930, have now been officially adopted. They show some additions to and changes from the first draft, based on suggestions and discussions since the publication of the latter. A particularly interesting feature is the thorough plan for official supervision of the product of cement works of all three classes, including a specified standard designation for sacks containing the product of these plants and provision for withdrawal of the privilege of using this designation if the product should fail to meet the standards. It is also provided that high-test or special cement—*hochwertiger Zement*—is to be packed in green bags, and this color is, of course, not to be used for other cements.

A newly-made provision is that for the minimum strength after 28-day water storage. In case of disputes, however, the values to be considered are the strengths at 3, 7 and 28 days combined storage. The requirements for withstanding the boiling test have also been made stricter; if a cement fails to resist this test, the test is to be repeated on cement that has lain 3 days in a layer approximately 5 cm. thick. The regulation for the addition of foreign material has also been sharpened, the present limit being 3 per cent.

The new strength requirements are:

(1) For the regular commercial cement:

7 days water storage: compression 180 kg./sq. cm., tension 18.

28 days combined storage: compression 350 kg./sq. cm., tension 30.

28 days water storage: compression 275 kg./sq. cm., tension 25.

(2) For high-test—*hochwertiger*—cement:

3 days water storage: compression 250 kg./sq. cm., tension 25.

28 days combined storage: compression 500 kg./sq. cm., tension 40.

28 days water storage: compression 400 kg./sq. cm., tension 30.

These values, of course, are for prescribed specimens of standard mortar. —*Zement* 21:230, April 21, 1932, and *Tonindustrie-Zeitung* 56:451, April 25, 1932.

Develops Edge-Runners With Individual Drives

Individual drives for the machines used in manufacturing industries have been gaining ground steadily ever since the automobile industry gave it impetus by means of its developments in reduction gearing. An objection that has had to be overcome in ceramic and similar industries is that unless steps are taken to prevent it, the motor and drive suffer rapid wear because of dust. A drive recently developed by the Maschinenfabrik Buckau R. Wolf Akt-Ges., Magdeburg, for the edge-runner grinding mill—the "dry pan" or "wet pan" no longer so well known in America but still much used in Europe—locates the motor and reduction gears in a space separated from the mill by a wall or partition and situated either above or below the mill. This not only relieves the delicate mechanism from the wear of dust, but also removes the former encumbrances to conveying equipment which carried the feed to the mill and removed the ground product. This drive is quieter, demands less power and is less subject to wear than older types of feared drives.—*Tonindustrie-Zeitung* 56:452, April 25, 1932.

Recent Patents

AMERICAN

Cement and Concrete

Top surface of concrete and the like and method of forming the same. Nathan C. Johnson, Englewood, N. J. No. 1,857,511.

Cement-clinker treatment. Harry M. Lamour and Stephen C. Pierce, Jr., Merced, Cal., assignors to Yosemite Portland Cement Corp., same place. No. 1,859,926.

Crushing and Grinding

Centrifugal rock crusher. Alvah D. Hadsel, San Francisco, Cal. No. 1,857,739.

Ball mill. Jules J. Deschamps, Paris, France. No. 1,859,499.

Drilling and Blasting

Blasting cartridge. Harold S. Pierce and Russell T. Sweeney, Indianapolis, Ind., assignors to Safety Mining Co., Chicago, Ill. No. 1,857,792.

Blasting cartridge. Frank H. Kneeland, Chicago, Ill., assignor to Safety Mining Co., same place. No. 1,857,813.

Rock-drill mounting. Gustave M. Nell, Detroit, Mich., assignor to Chicago Pneumatic Tool Co., New York, N. Y. No. 1,859,748.

Excavating

Excavating machine. Percy O. Hawkins, Hammond, Ind. No. 1,857,302.

Swinging bucket excavator. James A. Elliott, Seattle, Wash. No. 1,859,659.

Self-sharpening dipper tooth. John C. Taylor, Jr., Easton, Pa., assignor to Taylor-Wharton Iron & Steel Co., High Bridge, N. J. No. 1,860,338.

Miscellaneous

Safety mechanism for material-handling machines. Charles H. Wagner, Washington, D. C., assignor to Koehring Co., Milwaukee, Wis. No. 1,857,172.

Mixing aggregates with asphalt and cooling. Craig R. Arnold, Atlanta, Ga. No. 1,859,324.

FOREIGN

Cement

Raising the tensile and compressive strength of cement mortar or concrete. H. Nitze, Frankfurt a. Mr., Germany. German 549,200.

Portland cement. Ash Grove Lime & Portland Cement Co., assignee of Andrew Cundteigen and Guy O. Gardner, Kansas City, Mo. Canadian 322,246.

High-temperature cement. Addie Hutchinson, Portsmouth, O. Canadian 322,402.

Crushing and Grinding

Method of and means for sieving materials in impact pulverizers. P. Anger. British 371,034.

Rotary machines for breaking stone and like material. F. Parker, Ltd., and T. Lea. British 371,583.

Grinding mills. G. A. H. Mallickh. British 371,793.

Crusher. Jeffrey Manufacturing Co., Ltd., Ville La Salle, Que., assignee of Johan R. Bakstad, Columbus, O. Canadian 322,307.

Ore- and sand-reducing apparatus. Thomas William Keet, Klerksdorp, Transvaal, South Africa. Canadian 322,404.

Excavating

Excavating apparatus. Henry E. McKeen, Montreal, Que. Canadian 322,015.

Dredge or excavating buckets. Tyne Improvement Commissioners and S. A. Anderson. British 371,191.

Spud dredgers. Naamlooze Vennootschap J. &. K. Smit's Scheepwerven. British 371,772.

Gypsum

Method of producing plaster of Paris, modelling-plaster, or other kinds of plaster. E. C. Loesche and E. W. Stoll. British 372,223.

Gypsum concrete. Canadian Gypsum Co., Ltd., Toronto, Ont., assignee of George D. King, Chicago, Ill., and Fred J. Gough, Fort Dodge, Ia. Canadian 322,654.

Kilns

Shaft kiln for burning cement, to which the feed and the fuel are delivered mixed. H. Engel, Stettin, Germany. German 548,663.

Shaft kiln for burning cement. A. Andreas, Münster. German 548,976.

Sintering-machine apparatus. National Malleable and Steel Castings Co., Cleveland, O., assignee of Ernest D. Ekstedt, East St. Louis, Ill. Canadian 322,499.

Sintering machine. American Ore Reclamation Co., assignee of Edward W. Shallock, Chicago, Ill. Canadian 322,635.

Rotary kiln and cooler. F. L. Smidth & Co., assignee of Povl T. Lindhard, New York, N. Y. Canadian 322,720.

Material-Handling

Jigger conveyors. E. Ridgill. British 371,609.

Overhead ropeways. J. W. White and C. O. Valberg. British 371,726.

Underframes and buffer beams of quarry cars and the like. W. G. Allen & Sons (Tipton) Ltd., A. Weddell and W. T. Tolhurst. British 371,882.

Conveyor. Madruck Gesellschaft für maschinelle Druckentwässerung m. b. H., Düsseldorf, Germany. Canadian 322,314.

Quarrying

Hammering tools for use in excavating, mining, quarrying and the like. S. Baillie, British 372,042.

Mining machine. Jeffrey Manufacturing Co., Ville La Salle, Que., assignee of Ernst Feodor Muller, Columbus, O. Canadian 322,308.

Screening and Separating

Electrical precipitators. International Precipitation Co., Los Angeles, Cal. Canadian 322,090 (assignee of Arthur P. Knight, Glendale, Cal.) and 322,091 (assignee of Kenneth I. Marshall, Los Angeles).

Apparatus for separating dust from air. J. W. Jackman & Co., Ltd., and F. W. Neville. British 371,113.

Process and apparatus for separating or grading granular materials. L. Hoyois. British 371,174.

Screening apparatus. H. R. Jones and C. W. G. Barton. British 371,274.

Electrical installation for purifying gases. Siemens-Schuckertwerke Akt.-Ges. Berlin-Siemensstadt. German 548,365.

Electrical precipitator. Siemens-Schuckertwerke Akt.-Ges., Berlin-Siemensstadt. German 549,644.

Slag

Method and apparatus for making molten masses and slags become highly porous as they solidify. C. H. Schol. British 372,197.

Treatment of slag. Det norske Aktieselskab for Elektrokemisk Industri, Oslo, Norway. German 548,975.

Unclassified

Cold glazing of cement-asbestos plates. W. W. Triggs (Eternit Emaille Soc. Anon.). British 371,522.

Method of reinforcing asbestos cement, wallboard, or other similar materials. E. Hurden, A. P. Hurden and S. E. Beeson. British 371,956.

Apparatus for molding concrete and like plastic materials. F. Schlagintweit and J. Carmichael. British 372,153.

PIT AND QUARRY *will furnish, at its actual cost, a copy of any patent cited here. A charge of ten cents per copy is made by the U. S. Patent Office, Washington, D. C., and readers may procure a copy directly by addressing the Commissioner of Patents, with payment for copies requested. Postage stamps are not accepted by the Patent Office. We will endeavor to obtain copies of foreign patents for our readers but we cannot give assurance in every case for the reason that copies of such patents are not printed for distribution as liberally as are the American copies, nor is there a fixed charge per copy.*

Grants "Preformed" Rope Rights to Another Firm

The American Cable Co. announces that the Wickwire Spencer Steel Corp. has recently been added to the long list of wire rope manufacturers licensed to manufacture preformed wire rope under American Cable Co. patents.

Other companies in the United States who are licensed to make preformed wire rope are: American Steel & Wire Co., Broderick & Bascom Co., E. H. Edwards Co., Hazard Wire Rope Co., Macwhyte Co., Pacific Wire Rope Co., General Cable Corp. and the Wire Rope Manufacturing & Equipment Co.

Manufacturers' Publications

Each publication listed below contains information of interest to non-metallic mineral producers. Readers may obtain, without charge—except where a price may be stated—and without obligation, copies of any of these publications by writing directly to the manufacturers who publish them. Please mention PIT AND QUARRY *when writing.*

Air Separators

Handling Materials by Air. 16 p. (Raymond Bros. Impact Pulverizer Co., Chicago, Ill.) Describes and illustrates Raymond air separators and dust-collecting systems, discussing their adaptability, advantages, operation and construction. Also gives some typical installations in cement, gypsum and other plants and lists the company's products.

Concrete-Products Machinery

The Kent Red Line Concrete Products Machinery. 4 p. (The Kent Machine Co., Cuyahoga Falls, O.) Bulletin featuring the Kent tamper with concrete feeder and elevator, Kent strippers for concrete blocks and concrete tile, the Kent mixer and a new brick machine, with illustrations.

Engineering

Engineering Achievement. 4 p. (Issue No. 7. The Wellman Engineering Co., Cleveland, O.) A little pamphlet indicating the wide service offered by this company on material-handling problems.

Excavating Equipment

Byers Shovels and Cranes. 40 p. (Cat. No. 532. The Byers Machine Co., Ravenna, O.) A catalogue describing and illustrating the complete line of this company's shovels and cranes. Typical installations in sand-and-gravel and stone plants and on road-building jobs are shown. Points out by description and illustration the details of construction of the Byers complete machinery deck. Also contains specifications of the various models.

Flexible Couplings

American Flexible Coupling. 16 p. (Bull. No. 102. American Flexible Coupling Co., Erie, Pa.) Bulletin illustrative and descriptive of American flexible couplings, giving specifications and prices. Contains a partial list of prominent users of these couplings in the United States.

Gears

Farrel-Sykes High Speed Gear Units. 12 p. (Farrel-Birmingham Co., Inc., Buffalo, N. Y.) Goes into a general discussion of the adaptability and efficiency of the various types of Farrel-Sykes gear units. Also contains data sheets and illustrations.

Motors

Direct-Current Motors. 4 p. (GEA-1542. General Electric Co., Schenectady, N. Y.) Describes and illustrates Type B constant-speed, direct-current motors of ½ to 3 hp., giving details of construction.

Power Transmission

Line Shafting Equipment. 192 p. (Cat. 43. The Medart Co., St. Louis, Mo.) Condensed catalogue presenting facts about popular line shafting equipment—bearings, couplings, gears, sprocket chain, etc. States tables of dimensions, details of construction and list prices in such a way as to enable engineers, designers, mechanics and power users to plan installations of and purchase the equipment described. Profusely illustrated.

Regulators

Pressure and Liquid-Level Regulators. 8 p. (Bull. 1100-A. The Electric Controller & Mfg. Co., Cleveland, O.) Describes and illustrates the various uses of pressure and liquid-level regulators for automatic control of air, gases and liquids.

Appoints Distributors in Florida Territory

The McDonald Tractor Co., Orlando, Fla., and the Burgman Tractor Equipment Co., Jacksonville, have been appointed distributors in the Florida territory by the Chain Belt Co.

Pumpings from the Old Pit

Excerpts from the old files of PIT AND QUARRY *reveal many interesting sidelights on the activities of the pits, quarries and plants of former days. These are printed in this column each issue.*

Fifteen Years Ago

A RISE of 30 per cent. in production costs in the middle west was reported by E. Guy Sutton, general manager of the Carmichael Sand & Gravel Co., of Williamsport, Ind., due to the rapidly increasing costs of fuel, labor and equipment following the entrance of the United States into the world war.

* * *

L. A. Thorsen, known about the city of Crookston, Minn., as the "gravel king" sold his interests and retired from business after having been engaged in the production of sand and gravel for many years.

* * *

The Macksville Gravel Co., of Rockville, Ind., acquired an additional 50 acres of gravel deposits near its pit. The company also announced the purchase of $50,000 worth of new machinery.

* * *

Ten Years Ago

PLANS for the establishment of a sand-and-gravel plant on the banks of the Wabash River near Grayville, Ill., were announced by the newly-formed Penderglase Engineering Co. Officials of the company were George M. Penderglase, Howard Fischer, and B. S. Alnutt.

* * *

The first carload of lime was produced at the new plant of the Peerless White Lime Co., located at Mosher, Mo., in the Ste. Genevieve limestone district. Equipment in the plant included eight shaft kilns, a Kritzer six-cylinder hydrator, a Raymond air separator and a Bates Valve bagger.

Sand-and-gravel producers along the Raritan River in New Jersey were operating at capacity due to the demand for aggregates in that area. Heavy road-building programs and an increase in building was responsible for the demand.

* * *

Five Years Ago

ANNOUNCEMENT was made of the formation at Chicago of the John N. Bos Sand Co. The company planned to exploit the vast sand deposits of the Indiana dunes located on the southern shore of Lake Michigan.

* * *

A new four-kiln lime plant was started at Enterprise, Ore., by the Black Marble & Lime Co. C. A. Bingaman was president of the firm.

* * *

Harry W. Hubbs of Huntington, N. Y., acquired title to 30 acres of land at Dennisville, N. J., reported to contain rich deposits of silica. Plans were in preparation for the erection of a plant to handle 50 tons of material per day.

* * *

C. W. Hay of the Blue Diamond Co. was elected president of the Southern California Rock Products Assn. at the annual meeting of that organization held at Los Angeles. F. F. Gay, Consumers Rock & Gravel Co., was chosen vice-president; Paul Graham, of Graham Bros., Inc., treasurer, and E. Earl Glass was reëlected general manager.

New Machinery and Supplies

Small Truck Mixer Also May Be Used as Agitator

The new Rex 1½-cu.yd. Moto-Mixer (2-cu.yd. as an agitator) is announced as a new size, but not as a new machine, by the Chain Belt Co. Its design, construction and features are patterned closely from other members of the Rex Moto-Mixer line which have been in the field for more than two years without a major change.

When used as an agitating unit, this new Moto-Mixer fits perfectly into the wet plant employing a 2-cu.yd., 56-S plant mixer, handling one batch to a load.

As a 1½-cu.yd. truck mixer, this new Rex unit answers the growing demand of small plants for a light, low cost machine that can be mounted upon a small inexpensive truck. Many small plants and material yards, particularly those already having bins and batchers are finding this size profitable on part time work and small yearly concrete volume.

The drum of the standard Moto-Mixer design with conical front section is mounted with three-point suspension—a special SKF ball thrust bearing carrying the forward end and two Timken-mounted rollers supporting the rear. In addition, by shortening the diameter of the rear drum track, the entire drum is swung between the body sills to establish a low center of gravity.

Mixing water is measured accurately by means of a calibrated overflow pipe, extending into the mixing water compartment. This pipe is set for the desired quantity. All water over that amount overflows so that only the required amount of water can be carried to the job, eliminating all danger of accidental sweetening.

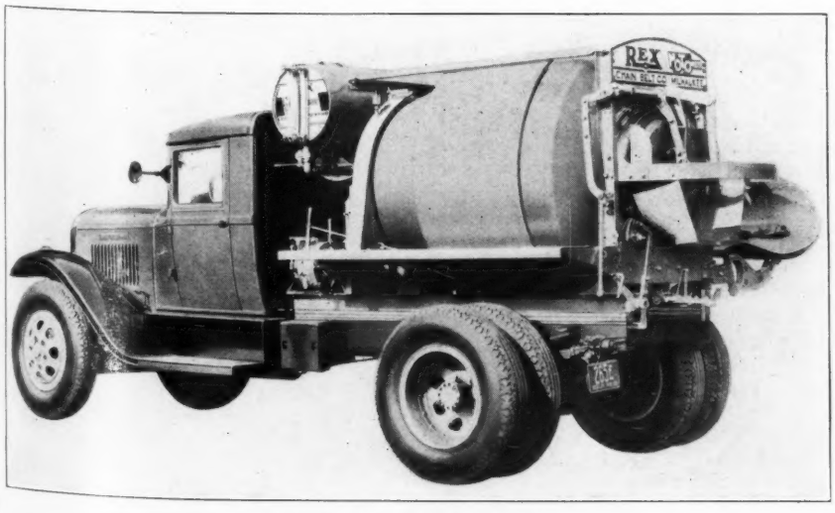
The tank has two compartments, one for mixing water—the other for washout water. Both equipped with calibrated sight gauges.

The distributing spout is of the Rex "one-man" type. It is fastened by two hinges in such a manner that one man can easily swing it from the cradle, in which it rides when the truck is traveling, into discharging position in a very short time.

The mixer can be had equipped with the Rex-Heil Jackass hoist which the manufacturers claim doubles the effective spouting area and permits discharging directly into a 3-cu.yd. storage hopper without using a ramp.

The drum is driven by an independent motor equipped with electric starter which operates from the truck's battery. All controls are located at the rear of the drum.

Complete information on this new Moto-Mixer can be had by writing the Chain Belt Company, Milwaukee, Wisconsin, asking for Rex Moto-Mixer Bulletin No. 219.



New truck mixer and agitator carrier.

New Air Separator Has Flexibility, High Output

The Sturtevant Mill Co., of Boston, Mass., has developed an entirely new and interesting air separator. This machine is a composite separator combining only those principles, proportions, and arrangements of old and new which have successfully withstood the critical observance of experienced engineers.

It is claimed that this new separator has most unusual features, that its flexibility of control is practically unlimited by means of quick and easy adjustments, that its product may be modified by the tiniest margin or within a great range without the attaching or detaching of any part, or changing of speed.

That its range of output may be varied from 30- to 40-mesh (on some materials as coarse as ¼ in.) to the equivalent of 600-mesh. That the tailings are effectively winnowed and thus there is a minimum amount of fines contained therein.

The deflecting and rejecting mechanism is unusually durable and efficient at constant speed, relying wholly upon adjustment for product variations within reasonable limits.

Whirl controls on adjustable return-air vanes and upon interior cones regulate and assist the fines to settle more quickly.

Metaphorically speaking, within an air separator is a continuous battle between the opposing forces of centrifugence, air currents (whirling and lifting) and gravity. Each force is harnessed and under the complete control of the operator. If equally balanced, nothing results but immediately that one force overbalances the other two, the equilibrium is upset and a result is achieved. The important objective is to so control these forces that the resultant product may be regulated to the will of the operator.

The feed enters the separator through a hopper and falls by gravity through a large chute upon a fast revolving circular disk or distributing plate from which it is immediately thrown, in fact, actually sprayed from its periphery in a fine, thin and even film, by centrifugal force, towards and against the surrounding circular walls of the separating chamber. The fan or whirler immediately above this distributing plate and within the separating zone, is constantly and violently whirling the air saturated material within this chamber round and around like a veritable cyclone. The effect is a complete stratification or segregation of the particles by weight. The large, heavy grains are quickly overcome by the pull of gravity, drop out of the mass and are immediately discharged, the next heaviest quickly follow and so on until the separating chamber is cleared, by this process of elimination, of all sizes which are not close to the product desired. Of that remaining, the coarsest and heaviest particles are thrown farthest and cling to or hug the encircling walls the hardest due to the greater centrifugal effect. Those particles not so heavy are affected less by centrifugal force and form the next layer and so on until at the center is only fine dust.

Only that part of this whirling mass of the predetermined size which it is desired to recover must be removed. It is obvious that if a suction or lifting draft from above sufficient to overcome the centrifugal and gravity effect upon the material below, only that material will be removed which is not

held strongly enough successfully to resist the suction and therefore this portion will be lifted or pulled out, leaving the remainder in the grip of the stronger centrifugal force aided by the constant pull of gravity.

To do this in a practical manner the separator employs an effective suction fan above the top opening to regulate its pull, and thus its suction, to lift out only that material of the fineness wanted, and deposit it in the outer settling chamber. Two fans are employed, the first being for centrifugal rejector-and-deflector effect and not suction and is located within the separating zone above the distributing plate. The suction or lifting fan is entirely separate, out of and above this zone. The action of one is diametrically opposed to the action of the other.

There are several more actions, necessary refinements for efficient operation. The upward current or suction must be strong enough to lift the fines in quantity in order to get capacity, which demands a strong lifting current. There must also be an effective means for permitting only the exact size wanted to pass into the finished product; all other must be rejected.

This is accomplished effectively and positively by increasing the effectiveness of both fans, thus making more positive their counteracting forces, then by increasing the upper fan's pull to overcome the lower fan's centrifugal effect, a precision adjustment for overbalance is possible for the release of the product specified. Again many particles are so near alike in size and weight as to make a selection difficult, therefore the lower fan is designed in the form of a powerful rejector and deflector through which nothing can pass without passing in between the ends of these many, rapidly whirling rejector blades, and against powerful centrifugal force and actually passing through them to escape, a most difficult task. Every particle is thus baffled, batted, kicked, deflected and thrown out unless it is sufficiently fine to overcome all of these adverse forces and knocks and, in spite of them, crowd through. The result is a precision product of any mesh from 50 to 600. The lower rejector deflecting-fan blades are adjustable, obviating the need of varying the number of blades or regulating speeds. The tailings or oversize are also remarkably clean. These restrictive or rejective effects may be regulated or modified by the operator to any reasonable degree at will, not by definite and obligatory steps, not by removing or attaching parts nor by a change of speed, but by simple and flexible rejector adjustments, giving infinite adjustment range, and product modifications.

There is another and very important adjustment for effective product control. Upon the inside surface of the cone in the separating zone, and below the distributing plate is a series of adjustable baffles. By changing the angle of these baffles, the whirl within this zone may be regulated, which means that the centrifugal effect is adjustable by the operator regardless of fan speed. Return air vanes and adjustments are used to prevent the fines from returning with the cleansed air, an effective winnowing device.

There is seldom need to add or remove fans, deflectors or rejectors, all are adjustable to the work demanded. Whether the feed is of great or small volume, whether it contains a large or small percentage of the product desired, whether the work is 50-mesh or 300-mesh, whether the feed is intermittent or steady, all these variables are ironed out by exclusive Sturtevant patented adjustments.

No central tube feed is used because Sturtevant engineers saw no mechanical advantage nor practical reason for it or of the great extra weight necessitated by such construction, nor the mammoth plain bearings accompanied by the extra wear and power and the complicated lubricating system which is a necessary evil of such a mechanism.

The plates, sheets, angles and channels are sufficiently strong to allow for the emergency of filling the entire separator cones with a solid mass representing tons of material without distortion. Its construction is so stiff, sturdy, and rigid that there is no weaving or vibration when operating under full load and highest speed; the shafts and gears have a big margin of safety, wear and tear is low and life is long, and they have proven satisfactory to a multitude of users.

Anti-friction bearings, cut and hardened gears, stiff angles and ample, heavy-welded plates are used.

When precision separation is demanded, precision adjustments become a necessity for accurate selection and in no other mechanism have these refinements been so perfected or carried so far, or are as simple or so easy of accomplishment.

Large man-holes make accessibility easy. Anti-friction bearings run easily and there are no oiling problems.

A cut-away view of the new air-separator showing operating and construction details.

Steep, anti-clogging cones, anti-friction bearings and large man-holes are featured.

Steep cones prevent clogging. Large feed openings allow for enormous circulating loads.

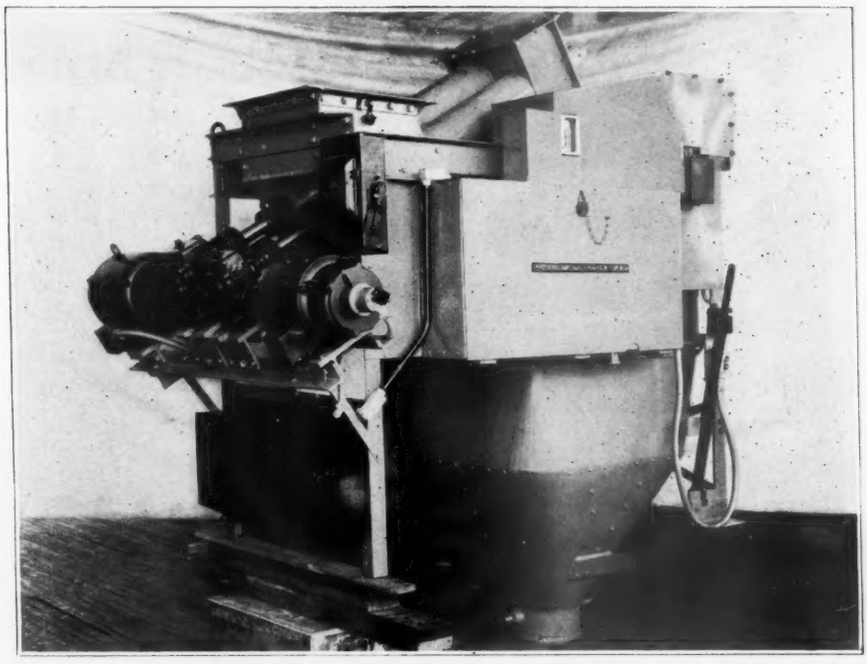
Sturtevant air separators are made in nine sizes, from 18 in. to 18 ft.

Four Suspension Points on Bulk-Cement Weigher

The recently introduced Class 39 Richardson automatic scale is a multiple-lever suspension-type scale for weighing bulk cement direct from bins into trucks or batch boxes. All weighing levers are mounted above the weighing hopper, there being four points of suspension. This construction prevents twisting of the hopper and insures proper support.

The weighing hopper is fed with cement from the overhead source of supply by means of two large screws, each screw running in its own separate dustproof and flushproof tube casing. The larger or main feed screw is driven by a 5 h.p. motor and the smaller or dribble screw is driven by a 2 h.p. motor. The flights of these screws are of half pitch. The inlet of each tubular housing is fitted with a flushproof sleeve and there is a similar flushproof sleeve at the delivery end of the tubular housing of each screw conveyor. The screw conveyors are inclined at an angle of 30 deg. and the combination of a large inlet hopper 18 in. by 18 in., the half pitch screws in their individual tubes, the flushproof sleeves which allow the flights only sufficient clearance to operate safely and the inclination of the conveyors, make the feeder flushproof under all conditions. By means of mercury switches, both screws are simultaneously started at the commencement of each weighing; the operator merely presses the "feed" button to accomplish this. When approximately 70 per cent. of the predetermined amount has entered the weighing hopper, the larger screw automatically stops; the smaller or dribble screw continues running until the correct amount of cement has been received in the weighing hopper, and then it too automatically cuts off. The accuracy of weighing can be noted at the completion of any weighing by noting the over and under indicator provided. An electrical interlock is provided so that even if the operator inadvertently pushes the wrong button, no trouble can ensue, for the "feed" button is only energized when the scale is ready to receive its weighing, and the empty weighing hopper is in correct balance; and the "discharge" button is only energized when the weighing has been accurately completed.

An indicator is provided to show whether the weighing is accurate, or the amount it varies from the desired figure. In the event of any overage or shortage in a weighing exceeding 1 per cent., the scale is electrically locked and the weighing can not be discharged. An access door is provided to correct any excess or short weighing that may prevent the discharging of the scale. This indicator also automatically shows whether or not the weighing hopper is in true empty balance at the commencement of each weighing.



Automatic scales for weighing bulk cement.

Accuracy of weighing is guaranteed to be within an average of ½ of 1 per cent. of the true weight. Control buttons and handle for operating the "damper" in the lower hopper are arranged below the scale so that complete batcher plant can be operated by one man, i.e., the trimmer on the truck. A six-figure continuous counter registers and totalizes the weighings made by the scale.

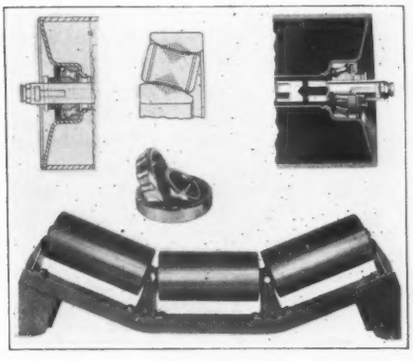
The manufacturer — Richardson Scale Co. of Clifton, N. J.—manufactures a similar scale of greater capacity for use by cement mills.

Improvements Noted in New Conveyor Carriers

A new anti-friction belt-conveyor carrier has just been announced by the Barber-Greene Co., Aurora, Ill. A study of the construction and performance of this carrier shows many improvements and simplifications over the conventional design.

The roller bearings (Shafer) are of an exclusive design and principle, being self-aligning, and taking thrust as well as radial load.

Each size of carrier has but one size roller unit, making these units and component parts interchangeable. The Barber-Greene carrier is made to interchange with any standard carriers for making replacements. The roller is made of 5½-in. seamless tubing metal. The ends are made of pressed steel with the outer roller race inserted under pressure. The inner tube is 1⅛ in. in diameter with two shoulders, one at each of the ends. The spindle is ¾ in. in diameter made of cold-rolled steel drilled and tapped at each end for grease fittings. The spindle is also drilled and reamed at each end for taper pins. The bearings are held in by the two labyrinth seal washers, shimmed so as to keep bearings tight. There are three collar spacers between the bearing race and the taper pins. In case of wear on the bearings or if for any reason the bearings should be tightened up,



Assembly and sectional views of the conveyor rolls.

it is a very simple matter to take out the taper pin on one side, insert necessary shim, and drive in the taper pin again.

The entire assembly is filled with high-grade grease which fills the bearings as well as the labyrinth seals, thus keeping out all the dust and grit. When the units are regreased all of the old grease is forced out and replaced with new, clean lubricant. The outer grease seal is pressed into the ends and it revolves with the roller.

The load rating of each roller bearing is 450 lb. By using a factor of safety of 4½, each roller can carry load of 200 lb. or the entire carrier a load of 600 lb.

Saving Through Safety

Insurance Companies and Safety Promotion

Rates for Quarry Compensation Can Only be Reduced Through Removal of Potential Hazards

By F. A. POLLOCK
Lumberman's Mutual Casualty Co.

RATES for compensation insurance on quarry operations are comparatively high, but rates are based chiefly on experience, and naturally the only way to reduce rates is to remove as much of the potential hazard as is possible so that accidents will occur with less frequency and then lower net cost for protection is a natural result. Any attempt to convince workmen that an accident-prevention program is in progress will be a flat failure unless the workmen are made to realize that the executives and their superintendents of foremen are sincere beyond the monetary value of the undertaking.

Assuming that the management is "sold" on the necessity of reducing accidents my first step is to assist in organizing a safety committee to produce the best results; second, helping to educate the workmen; and third, to suggest enforcement of safe practices.

In the organization of a safety committee the head foreman of the operations should act as chairman. The other members should consist of the maintenance man, one or more of the foremen, and a clerk to act as secretary. All safety matters should clear through this committee. Before the regular monthly meeting is held all committee members should inspect all parts of the quarries to determine what hazards exist in connection with the equipment or working conditions. This report should be made part of the safety minutes. One man should be designated to look after the first-aid equipment and the proper display of safety bulletins. The secretary should keep the minutes of each meeting providing copies for each member of the committee and one for the manager's desk.

The insurance engineer should be present as a guest at the monthly inspection and meetings, and while the committee meetings are conducted strictly as a company organization, he is sometimes able to offer advice of value in the work. His duties compel him to be a student of accident prevention and no study is complete without first-hand knowledge of the causes and known methods of prevention in the particular class of business he is servicing.

Analysis of past accidents would be valuable and is almost imperative in any successful accident-prevention campaign. When this has been made the operator knows best where to concentrate his safety-committee activities.

Because the insurance engineer is not a part of the organization he can make suggestions and recommendations from a safety standpoint which might have some other significance if offered by a member of the committee.

He is familiar with the factors making up the governing rate. His participation in safety work is not only a benefit to the company he represents but the insured as well—to the insurance company because chance for profit lies in maintaining a favorable balance between premium received and premiums paid; to the insured risk because of the benefits which accrue as the result of a favorable experience.

Experience in the quarrying business has demonstrated there are a number of well-known hazards in the average quarry which can be corrected and accidents avoided.

1. *Foot Paths in Quarries.*—On account of the number of accidents from employees being run down by trains, foot paths to all the working points on the quarry floor should be marked and cleaned. Where these paths cross tracks, guard railings should be provided to prevent one from stepping in front of an approaching train. In winter time the principal paths should be kept clear of snow. Men should then be ordered not to use the tracks as a walkway.

2. *Stairways and Ladders.*—Stairways should be installed at all convenient points for entering or leaving the quarry. Where slopes are over 30 deg. and under 50, hand-rails should be provided on the paths, when over 50 deg. stairways or ladders should be provided.

3. *Bank Trimmings.*—As the falling of chunks and bowlders has caused many serious accidents, the banks of a quarry should be kept carefully trimmed and free from any overhanging or loose material which might fall and cause someone a serious injury. Men doing this work should be provided with safety lines and life belts.

4. *Track Repair Crews.*—Men should never be allowed to work on railway lines alone; no matter how small a crew one should be designated as a safety man to warn the rest of approaching trains.

5. *Goggles and Their Use in Quarries.*—Many an eye has been lost in starting holes in solid rock, breaking chunks and picking in frost, so it would not be amiss to provide all employees with goggles and instructing them when to wear them.

6. *Guard Railing.*—When railroad tracks run parallel or close to buildings and paths cross the tracks at the building entrance, railings should be placed between the door of the building and the track across the path in order to prevent employees from stepping in front of moving trains.

7. *Blocking Frogs and Switches.*—Many serious accidents have occurred to trainmen who caught their feet in switches, so this equipment should be blocked in every quarry. The old-type chunk of wood soon wears out and the so-called Hart block has been designed to eliminate the extra cost of replacement. This piece of wood is so constructed that it can be bolted to the flange of the rail and, should the train be derailed, it would clear the block entirely.

8. *Lights on Trains.*—As most trains are pushed out of quarries there should be a light on the end opposite the locomotive. A regulation switchman's lantern tied to the car has proved to be the most successful and economical to maintain, as electric wires and their connections are often broken.

9. *Trestles and Bridges.*—Wherever a quarry railroad is bridged over another travel way, the bridge should be boarded up and wings should be built in such a manner as to prevent the material which falls from quarry cars in transit from falling on the people or equipment below.

10. *Car Cleaning.*—Many men have been killed while cleaning dump cars when in the dumping position. Cars must be securely blocked before work is started.

11. *Protecting Car Repair Men.*—All cars set on side tracks should be securely blocked and a D-rail set at the main line. This will prevent the car from running away and getting on the main line. If a man is working on the car the D-rail will prevent a locomotive or other cars from bumping it. The key to the D-rail lock should be carried by the repair men.

12. *Locomotives:*

A. Foot-boards have always been the cause of many serious accidents and they should not be a part of this equipment. Side steps installed on the front and rear of the engine will take their place.

B. Shovels, picks and bars should

not be carried where they will interfere with the use of grab irons on hand-holds.

C. In moving locomotives the bell must be rung as a warning to the crew, and when approaching shovels it must be rung or whistle blown.

13. *Shovel Equipment:*

A. A ladder with a hand-rail should extend from the floor-line to a point of the boom.

B. On electric shovels the equipment house should be erected over the meters and switch installation and the number of the shovel should be painted over the door of this building. The only key to this door should be kept in the hands of the shovel operator and if any work has to be done on the feeder cable leading from this switch to the shovel the man in charge of this work will have to receive this key from the shovel operator, thus preventing the possibility of a mistake in cutting off the current on the wrong shovel. This will eliminate the possibility of an accident to a workman by cutting into a hot line.

C. A safety belt should be provided for each shovel and men working on booms should be required to wear it. This will prevent a serious accident should he slip.

14. *Hand Tools.*—Many a hand has received a serious injury where the employee has been allowed to use tools with split or cracked handles. Any such equipment should be condemned at once and new handles installed.

15. *Blasting:*

A. Metal shelter houses should be provided for workmen throughout the quarry. Those of the circular type that can be rolled are the most convenient as the men can keep them close to the shovel operations.

B. Electric blasting machines should be provided with locks so that unauthorized persons can not cause a serious accident by tampering with them.

C. Air-whistles should be installed at suitable points on the air-lines throughout the quarry. Whistles should always be sounded, and at night there should be a red flare-light to warn the men that a blast is about to be set off and its location.

16. *Locomotive Cranes.*—On account of the shear hazard on cranes, devices should be provided to warn employees in the vicinity that the machine is swinging.

17. *Draw-Bar Heads.*—On account of the number of feet that are lost every year on car draw-bars, a rubber belt guard should be installed on the end of every car over the top of each draw-bar.

One good safety-bulletin board posted near the time-clock or some other place on the property where most men pass, and a number of small ones in the eating houses will be of great help in the education of the workmen along safety lines.

Eating houses may be so fixed with tar paper that safety motion-pictures can be shown to the workmen during the lunch period. This has been tried in a number of large quarries and has proved successful.

The majority of the men should at some time receive first-aid training. First-aid kits should be put up in dinner pails and should be installed in every locomotive and shovel in the quarry. The operator of these machines should be responsible for the kit.

It has been found in small towns where quarries are located that safety education in schools will reflect in the accident experience in the quarry as the children are sure to bring home ideas along these lines to their parents. And last but not least the personal contact made by the safety engineer will do much toward educating the workman as to his safety.

We believe that an employer is responsible for the safety and welfare of his employees. He is entitled to the coöperation of all his employees in safety, which is so important to themselves. Discipline at times is necessary, and men should expect it and employers should enforce it. The manner of enforcing discipline is best left to the individual enterprise.

The management must show active and sincere interest; superintendent, foremen and safety engineer must work together. Safety education must be done in a manner that will reach every employee, and discipline should be used only when experience demonstrates its necessity.

Cement Plants, Quarries Enter June Safety Drive

With approximately 100 cement plants and quarries enrolled in the annual June No-Accident campaign, W. M. Kinney, general manager of the Portland Cement Assn., declares that, "an analysis of previous low-accident records established in the past six June campaigns conducted by the association indicates that it is not only mathematically possible, but quite probable, that all of the plants in the membership can operate without mishap during the entire month. Last year, the total of 13 accidents reported by the membership for the month of June represented a 53 per cent. reduction over the low record established the previous year. We are looking forward to the establishing of a new all-time low record in June 1932."

All the plants enrolled have been supplied with a specially-designed safety flag which was raised on the plant flagpole on the morning of June 1. These flags will fly continually night and day until an accident occurs in one of the plants, at which time the flag will be hauled down. Several plants have had these flags flying for two and three years in succession until there is left but a few ribbons of the original flag.

The Stockholders of the Cement Industry announce with profound sorrow the passing of Dividends. Gone never to return unless through resurrection by good business sense.

Funeral private except for employes.

Family requests no flowers.

THE black-bordered card symbolic of mourning, reproduced above, was mailed anonymously to PIT AND QUARRY under a New York, N. Y., postmark and was received June 2. A number of individuals prominent in the cement industry also report receiving the cards. The message is self-explanatory.

A Correction

K. H. Behre, sales manager of the Vermont Asbestos Corp., calls attention to an error in the article *Georgia Leads All States in Production of Asbestos and Fullers' Earth* which appeared in the May 18, 1932, issue of PIT AND QUARRY, written by Richard W. Smith, asst. state geologist. "We believe you will find that Vermont and not Georgia leads in the production of asbestos," declares Mr. Behre. Reference to figures compiled by the U. S. Department of Commerce on asbestos production indicate that Mr. Behre's belief is correct. Latest figures show that, in 1930, 4,242 tons were produced in the United States and the Vermont Asbestos Co. produced approximately 3,000 tons of this total in Vermont.

New Incorporations

STE. GENEVIEVE MARBLE QUARRIES, INC., Indianapolis, Ind. 2,000 shares n.p.v. William M. Johnson, Verne Crisler and C. T. Burnett. To quarry marble, talc, slate and other minerals.

RIO ROCK PRODUCTS, INC., Los Angeles, Cal. 7,500 shares. Oron Evans, Ned Mahon, Matthew Noonan and Charles Easton, all of Los Angeles.

MIDWEST MATERIAL CO., Racine, Wis. 100 shares n.p.v. Russell Frank; Charles Smith; Dr. E. J. Schneller, 3005 Wright Ave., Racine.

AMSTERDAM CRUSHED STONE CO., INC., Amsterdam, N. Y. Capital $20,000. William J. Wallin, Katherine S. Wallin and Dominick Rocco.

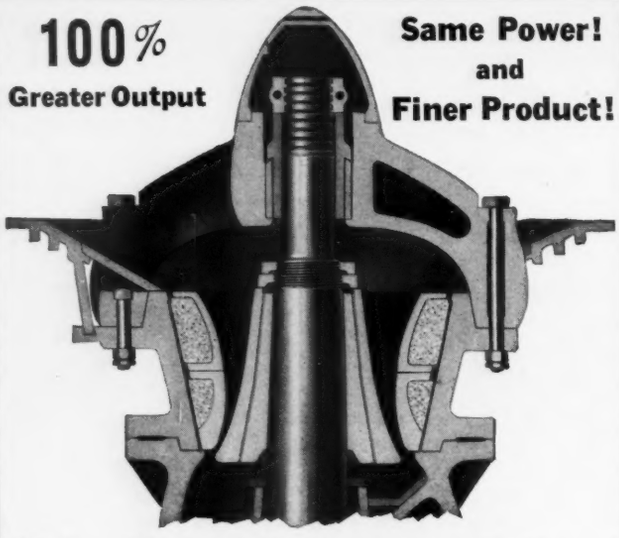
LANNON MATERIALS CORP., Lannon, Wis. 250 shares @ $100. H. Behrens, H. Brum and K. Klasner. To produce sand and gravel.

NIAGARA LIME CO., Buffalo, N. Y. Capital $40,000. L. C. Gabriel.

ROCK RIDGE SILICA SAND CO., Patton, Pa. Capital $5,000. John F. Prindible.

100%
Greater Output

Same Power!
and
Finer Product!



Make That Old Gyratory Deliver!

With Our New Patented

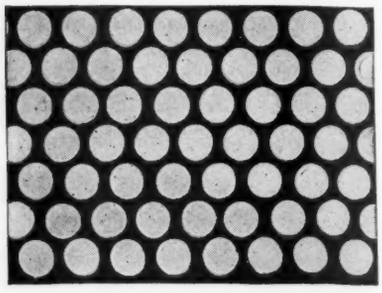
BELL HEAD AND CONCAVES

If you are now using two crushers to get your small sizes, you can now shut down one and save the difference. With no increase in power, you can double your capacity and get a finer product. Users are loud in their praise of this improvement. Send for Bulletin 1110.

Traylor Engineering & Manufacturing Co.
ALLENTOWN, PENNSYLVANIA

NEW YORK 2513 Empire State Bldg. | CHICAGO 2131 One LaSalle St. Bldg. | LOS ANGELES 908 Chester Williams Bldg.
SALT LAKE CITY 101 W. 2nd South St. | SEATTLE 815 Alaska Bldg.
TIMMINS, ONTARIO, CANADA, Moore Block
Export Department, 104 Pearl St., New York City—Cable Address: "Forsaltra"

MORROW SCREEN PLATES



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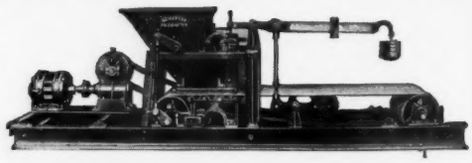

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☐Barges, steel
☐Belt dressing
☐Belt fasteners
☐Belting, conveyor and elevator
☐Belting, transmission
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☐Belt plates
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☐Bin gates
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☐Bins, steel
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☐Bodies, Motor Trucks
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☐Buckets, Dragline
☐Buckets, Orange Peel
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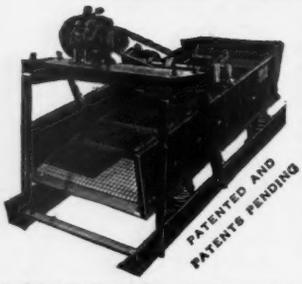

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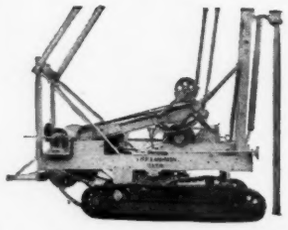

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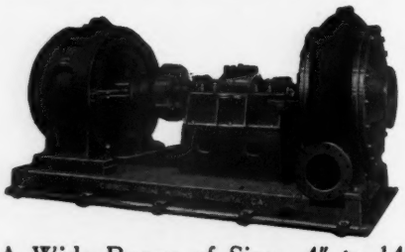

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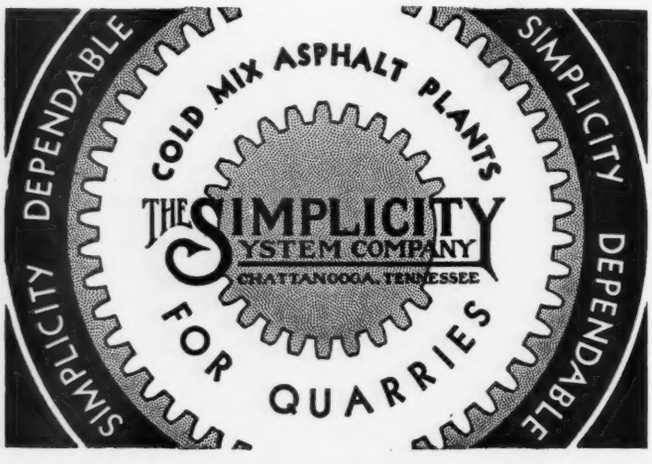

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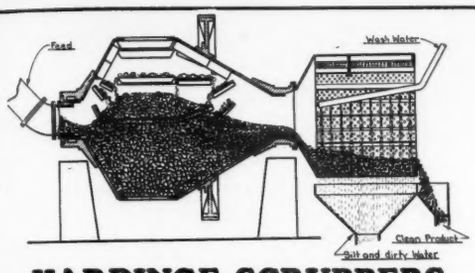

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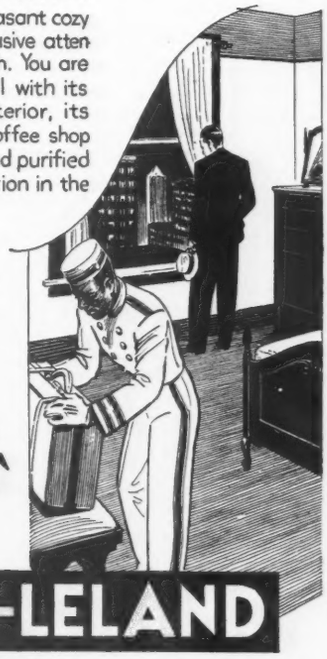

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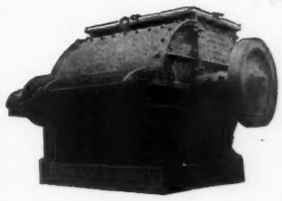

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